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Postoperative nausea and vomiting after facelift surgery despite routine dual antiemetic prophylaxis

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Abstract

Background: Postoperative nausea and vomiting (PONV) is a common complication of surgery and anesthesia. We evaluated its incidence, associated factors, and clinical consequences after facelift surgery under routine antiemetic prophylaxis.

Methods: This retrospective single-center cohort included 220 consecutive patients undergoing elective facelift surgery in 2025. General anesthesia was maintained with sevoflurane; 212 patients

(96.36%) received dexamethasone and ondansetron. PONV was defined as any nausea (visual analogue scale ≥1) and/or vomiting within 24 hours. Patient and procedural variables were evaluated using multivariable logistic regression.

Results: PONV occurred in 137 patients (62.27%; 95% confidence interval [CI]: 55.71–68.42%); 108 (49.09%) vomited and 127 (57.73%) required rescue antiemetics. Concurrent blepharoplasty (odds ratio [OR]: 5.674; 95% CI: 2.704–11.905) and operative duration (OR per minute: 1.013; 95% CI: 1.009–1.018) were independently associated with PONV. The Apfel score was not significantly associated with PONV (p=0.262). Hospital stay was longer in patients with PONV (48.31 ± 6.79 versus 39.19 ± 6.80 hours; p<0.001), and fewer were very satisfied (2.19% versus 81.93%; p<0.001).

Conclusions: PONV was frequent after facelift surgery despite routine dual prophylaxis. Concurrent blepharoplasty and longer operative duration were independently associated with PONV. Restricted variation in baseline risk factors limits interpretation of the nonsignificant Apfel association. Prospective studies should assess preventive strategies for prolonged and combined procedures.

Keywords: Postoperative Nausea and Vomiting; Rhytidoplasty; Blepharoplasty; Antiemetics; Anesthesia, General; Risk Factors

Background

Postoperative nausea and vomiting (PONV) is a common complication of surgery and anesthesia [1, 2]. The present definition is the development of nausea, vomiting, or retching within the first 24 postoperative hours. Studies utilizing this definition show that PONV affects approximately 20% to 30% of patients undergoing general anesthesia, while the frequency rises up to 80% in high-risk subjects [1–3]. Numerous surgical, anesthetic, and patient-related factors are implicated in PONV likelihood and severity [4, 5]. Beyond the morbidity, PONV can delay hospital discharge, increase unplanned postoperative admissions, and substantially reduce patient satisfaction [6].

The risk of PONV after facelift surgery is particularly important because, beyond the substantial patient discomfort it causes, forceful vomiting can increase venous and arterial pressures through vigorous contraction of the abdominal and thoracic muscles. This impact may considerably increase the risk of postoperative hematoma, which is the most feared complication of rhytidectomy [7, 8]. Consistent with this concern, several studies have demonstrated that strategies aimed at controlling postoperative hemodynamic responses and preventing vomiting may reduce hematoma formation. In one study, prophylactic administration of antiemetics, analgesics, and antihypertensive agents before extubation reduced the incidence of hematoma from 7% to 0% [9]. Other corroborating evidence can be drawn from abdominoplasty, where postoperative emesis elevated hematoma incidence to 62.5% versus 9.25% [10]. PONV is therefore a potential threat to surgical outcome. Furthermore, the typical rhytidectomy patient is almost exclusively female (>90%) and frequently perimenopausal or postmenopausal [11]. Due to this sex distribution, the great majority of patients already carry one classic Apfel risk factor, which includes sex (female), smoking status (non-smoker), history of PONV, and postoperative opioid use [12]. The rhytidectomy procedure itself may also be considered as causing greater levels of risk compared to other surgeries since it requires prolonged general anesthesia, is frequently (>50%) performed with concurrent procedures [11], and is performed in a site with close proximity to the oropharynx.

Evidence on PONV risk factors is extensive in general surgical populations. The Apfel simplified risk score is the most widely used tool and is accurate for many fields of surgery [13, 14]. Interestingly, when examined specifically for aesthetic surgery, it has been reported that surgical site was a risk factor as well as female sex and prior PONV [15]. The extent of the procedure also seems to have an impact. In facial feminization surgery, the incidence of PONV was far greater versus those undergoing rhinoplasty alone (37% vs. 11%) [16]. Prolonged surgery may also increase PONV risk [17]. In fact, there appears to be a shift in the factors determined to be associated with PONV based on emerging evidence from more recent studies focusing on patients undergoing procedures

involving the head, neck and/or face [18]. Given the high risk of PONV in these procedures, including facelift surgery, multimodal prophylaxis with antiemetic agents targeting different mechanisms of action is commonly used to enhance preventive efficacy [19–21].

In this study, we aimed to determine the incidence of PONV within the first 24 postoperative hours among consecutive patients undergoing facelift surgery who received routine dual antiemetic prophylaxis irrespective of their risk score. Secondarily, we assessed whether classic patient-related risk factors and the Apfel score were associated with PONV in this population. We also evaluated the associations of concurrent head and neck procedures and operative duration with PONV, as well as the impact of PONV on hospital length of stay and patient satisfaction.

Methods

Study design and ethical approval

This study is a retrospective single-center cohort study evaluating patients who underwent facelift surgery (rhytidectomy) at Memorial Bahçelievler Hospital. The study protocol was approved by the Memorial Bahçelievler Hospital Ethics Committee (approval date: 25.08.2026, approval number: 179; chairperson: Prof. Dr. Mustafa Kürklü). All steps of the study were conducted in accordance with the principles of the Declaration of Helsinki. Given the retrospective nature of the study and the use of de-identified data, the requirement for individual informed consent was waived by the ethics committee. The STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guideline was adhered to in the reporting [22].

Patient selection

All patients who underwent elective facelift surgery at our center between January 2025 and December 2025 were consecutively assessed for eligibility. Inclusion criteria were age ≥18 years, elective rhytidectomy, an American Society of Anesthesiologists (ASA) physical status of I-III, and complete perioperative records.

Exclusion criteria were emergency surgery, rhytidectomy combined with a simultaneous surgical procedure outside the head and neck region (e.g., trunk or extremity procedures), a documented history of chronic nausea and vomiting, and unavailable anesthesia or postoperative follow-up records.

Concurrent aesthetic procedures involving the head and neck region, including blepharoplasty, fat injection, lip lift, neck lift, eyebrow lift, rhinoplasty, bichectomy, forehead lift, and jaw implant, are routinely performed at our center. Patients undergoing any of these procedures were not excluded. Each concurrent procedure was recorded as a separate variable and included in the analysis. All patients underwent general anesthesia for the index rhytidectomy procedure.

A total of 236 patients were assessed for eligibility during the study period. Sixteen patients were excluded: 5 because of an American Society of Anesthesiologists physical status of IV or higher, 7 because of a simultaneous surgical procedure outside the head and neck region, 1 because of a documented history of chronic nausea and vomiting, and 3 because of incomplete perioperative records. The remaining 220 patients were included in the analysis (Fig. 1).

Anesthesia and antiemetic prophylaxis

General anesthesia was administered with standard monitoring. Anesthesia was induced with propofol and fentanyl. Maintenance of anesthesia was provided with sevoflurane in all patients; propofol was used for induction only, and no patient received propofol-based total intravenous anesthesia for maintenance. Nitrous oxide and neostigmine were not used in any patient. Because maintenance was uniformly sevoflurane-based and nitrous oxide was not used, the anesthetic maintenance technique did not vary across the cohort and therefore could not have acted as a confounder for the associations examined.

PONV prophylaxis was administered routinely, in accordance with the institutional protocol (dexamethasone 8 mg intravenously after induction of anesthesia and ondansetron 4 mg intravenously toward the end of surgery) in effect during the study period, irrespective of individual

risk score. In a limited number of cases, scopolamine was added at the discretion of the anesthesiologist. Patients who developed nausea or vomiting postoperatively received rescue antiemetic therapy (metoclopramide, 10 mg intravenously) in accordance with contemporary consensus recommendations [2].

Data collection and variables

Data were extracted from the hospital electronic record system, anesthesia monitoring forms, and postoperative nursing observation charts into a standardized data collection form prepared for this study.

Preoperative variables: age, sex, body mass index, ASA physical status class, menopausal status, smoking and alcohol use, oral contraceptive and hormone replacement therapy use, selective serotonin reuptake inhibitor/serotonin-norepinephrine reuptake inhibitor (SSRI/SNRI) use, chronic opioid and chronic antiemetic use, history of prior PONV, history of motion sickness, preoperative anxiety level on a 0-10 visual analogue scale (VAS), and Apfel risk score. The Apfel score was calculated from its four original components: female sex, non-smoking status, a history of PONV or motion sickness, and anticipated postoperative opioid use. The fourth component was determined preoperatively from the planned analgesia protocol. Postoperative opioid administration was recorded separately as an outcome-period variable.

Intraoperative variables included presence and type of concurrent head and neck procedures, duration of surgery, fentanyl and tramadol use and dosages, use of local anesthetic and epinephrine, volume of intravenous fluid replacement, estimated blood loss, need for blood transfusion, and antiemetic prophylaxis agents administered.

Postoperative variables were nausea VAS score within the first 24 hours, presence of vomiting, dizziness, need for rescue antiemetic, postoperative opioid use, length of hospital stay, and patient satisfaction assessed at the 24th postoperative hour using a 5-point Likert scale (very dissatisfied, dissatisfied, neutral, satisfied, very satisfied).

Outcome measures

The primary outcome was the development of PONV within the first 24 postoperative hours. Although PONV is defined as the occurrence of nausea, vomiting, or retching within the first 24 postoperative hours [1, 2], we did not define retching as a separate variable in our records. In this study, PONV was therefore defined as any nausea (VAS ≥ 1) and/or at least one vomiting episode within the first 24 postoperative hours. Nausea severity was assessed using a 0–10 cm VAS, with 0 indicating no nausea and 10 indicating the worst nausea imaginable. Nausea was assessed during the first 24 postoperative hours by the attending clinical team. Secondary outcomes included the need for rescue antiemetic, length of hospital stay, and patient satisfaction score at the 24th postoperative hour.

Statistical analysis

Statistical analyses were performed using IBM SPSS Statistics version 27.0 (IBM Corp., Armonk, NY, USA). A two-sided $p<0.05$ was accepted as the threshold for statistical significance in all analyses. The normality of continuous variables was assessed using histograms and Q-Q plots. Continuous variables were presented as mean ± standard deviation or median (25th-75th percentile) depending on their distribution. Categorical variables were reported as frequency and percentage. The Student's t test was used for normally distributed continuous variables and the Mann-Whitney U test for non-normally distributed variables. For 2x2 categorical comparisons, the chi-square test with Yates' continuity correction was applied, and Fisher's exact test was used where expected cell counts were small. For variables with three or more categories, the Pearson chi-square or the Fisher-Freeman-Halton test was used, and significant categories were additionally indicated.

To identify independent predictors of PONV, variables with $p<0.10$ in univariate analysis were entered into a multivariable logistic regression model using forward (conditional) selection. Variables that formed part of the outcome definition (nausea VAS score and vomiting) and variables that arose after the outcome (rescue antiemetic use, dizziness, postoperative opioid use, length of hospital stay,

and patient satisfaction) were not entered into the model. Model results are presented with β coefficient, standard error, odds ratio (OR), and 95% confidence interval (CI). Explanatory performance of the model was summarized using the Nagelkerke pseudo-R^2, and multicollinearity was assessed using the variance inflation factor (VIF).

Because all eligible consecutive cases within the defined period were included, no a priori sample size calculation was performed. The resulting sample of 220 patients allowed estimation of the observed PONV incidence with an absolute precision of approximately ±6.5%. As complete records were a condition for inclusion, analyses were performed on complete data, and no imputation for missing data was required.

Results

Patient characteristics and PONV incidence

Of the 236 consecutive patients assessed for eligibility during the study period, 16 were excluded and 220 were included in the analysis (Fig. 1). Of these, 212 (96.36%) were female, with a mean age of 48.11 ± 11.13 years and a mean body mass index of 24.28 ± 3.17 kg/m². ASA physical status was I or II in 218 patients (99.09%) (Table 1). All procedures were performed under general anesthesia; nitrous oxide and neostigmine were not used in any case, and no patient required blood transfusion.

PONV developed in 137 patients (62.27%; 95% CI: 55.71%-68.42%) within the first 24 postoperative hours. Vomiting occurred in 108 patients, corresponding to 49.09% of the entire cohort and 78.83% of those who developed PONV. The median nausea VAS score was 3 (0-5) for the entire cohort, 4 (3-6) in the PONV group, and 0 (0-0) in the non-PONV group ($p<0.001$). Rescue antiemetic therapy was required in 127 patients (57.73%), corresponding to 92.70% of patients who developed PONV. Dizziness was reported in 103 patients (46.82%), all of whom were in the PONV group (75.18%) (Table 3).

Patient-based risk factors and the Apfel score

No preoperative variable differed significantly between the groups, including sex, smoking, prior PONV, motion sickness, menopausal status, hormonal therapy, alcohol use, chronic opioid or antiemetic use, and preoperative anxiety score (all $p>0.10$). SSRI/SNRI use was higher in the PONV group (37.23% vs 25.30%) but did not reach statistical significance ($p=0.093$) (Table 1).

The distribution of the Apfel risk score did not differ significantly between the PONV and non-PONV groups ($p=0.262$). Overall, an Apfel score of 1 point was observed in 21.36% of patients, 2 points in 60.00%, and 3 points in 17.27%, whereas scores of 0 and 4 were recorded in only 2 and 1 patients, respectively (Table 1).

Surgical and intraoperative factors

All variables significantly associated with PONV were procedure-related (Table 2). A concurrent head and neck procedure was performed in 144 patients (65.45%), among whom PONV occurred in 72.92%, compared with 42.11% among patients undergoing isolated rhytidectomy ($p<0.001$). PONV occurred in 84.88% of the 86 patients who underwent concurrent blepharoplasty, compared with 47.76% of those who did not ($p<0.001$) (Fig. 2). Concurrent fat injection was also associated with PONV, which occurred in 77.08% of patients with and 58.14% of patients without a concurrent fat injection ($p=0.026$). The differences observed for lip lift ($p=0.051$) and eyebrow lift ($p=0.056$) did not reach statistical significance, and no significant association was found for neck lift ($p=0.187$), rhinoplasty ($p=0.326$), bichectomy, forehead lift, or jaw implant ($p=1.000$ for each).

Duration of surgery was markedly longer in the PONV group (344.19 ± 79.52 minutes vs 254.65 ± 83.84 minutes; $p<0.001$) (Fig. 3), with correspondingly higher intravenous fluid replacement and estimated blood loss (both $p<0.001$) (Table 2). Fentanyl and tramadol use and dose, local anesthetic use, and epinephrine use did not differ between groups (all $p>0.05$).

Antiemetic prophylaxis

Dexamethasone was administered to 219 patients (99.55%), and 212 patients (96.36%) received both dexamethasone and ondansetron, irrespective of the Apfel score; neither differed significantly between groups (dexamethasone p=0.377; ondansetron p=0.055). Scopolamine was administered to 4 patients (1.82%) (Table 2).

Postoperative outcomes associated with PONV

Patients who developed PONV had a mean hospital stay approximately 9 hours longer than those without PONV (48.31 ± 6.79 vs 39.19 ± 6.80 hours; p<0.001) and reported substantially lower satisfaction. The proportion reporting being “very satisfied” was 81.93% in the non-PONV group versus 2.19% in the PONV group, and no patient without PONV reported a neutral or negative rating (p<0.001) (Table 3). Postoperative opioid use was lower in the PONV group (24.82% vs 37.35%), although the difference was not statistically significant (p=0.068).

Multivariable analysis

Two variables were retained in the final model (Table 4): concurrent blepharoplasty (OR: 5.674, 95% CI: 2.704-11.905; p<0.001) and duration of surgery (OR: 1.013 per minute, 95% CI: 1.009-1.018; p<0.001). The latter corresponds to approximately 2.2-fold higher odds of PONV for every additional 60 minutes of surgery, estimated from the rounded coefficient. The Nagelkerke pseudo-R^2 was 0.413, and the VIF of 1.027 did not indicate meaningful multicollinearity. No other candidate variable was retained, including SSRI/SNRI use (p=0.091), any concurrent head or neck surgery (p=0.205), intravenous fluid replacement (p=0.198), and blood loss (p=0.094).

Discussion

In this series of 220 consecutive rhytidectomy cases receiving routine dual antiemetic prophylaxis, the incidence of PONV within the first 24 postoperative hours was 62.27%, and nearly half of the patients experienced vomiting. The most notable aspect of our findings was that none of the classic

patient-based risk factors was significantly associated with PONV, although these findings should be interpreted cautiously given the restricted variability of several risk factors in this cohort. In contrast, every variable associated with PONV was procedure-related. In the multivariable analysis, concurrent blepharoplasty (OR: 5.674) and duration of surgery (OR: 1.013/minute) were the only factors independently associated with PONV. PONV development was also associated with an average nine-hour increase in length of hospital stay and a decrease in patient satisfaction. These findings suggest that, in facelift surgery, procedural factors may contribute substantially to PONV risk even when conventional antiemetic prophylaxis is routinely administered.

The incidence we observed was substantially higher than the 37%-38% reported in facial feminization surgery and the 11% reported for rhinoplasty at the same center [16], and was more than twice the pooled prevalence of 27.7% (95% CI 23.3 to 32.1) derived from 23 studies involving 22,683 patients from general surgical populations [3]. Several factors might contribute to the differences. The mean duration of surgery in our cohort was 310.41 minutes, substantially longer than the 90-minute duration marginally associated with increased PONV risk [17]. Concurrent procedures were performed in 65.45% of our patients, which may increase risks for PONV. Furthermore, our cohort was 96.36% female, and the definition of PONV included any nausea with a VAS score of 1 or higher. The latter may have increased detection compared to definitions reliant upon clinical severity. Body mass index was not associated with PONV in our cohort ($p=0.716$), which is consistent with systematic evidence that elevated body mass index is not a risk factor for PONV [23]. Although we used an inclusive definition for PONV, vomiting alone occurred in 49.09% of patients and rescue antiemetic use was required in 57.73%, indicating that the frequency we report reflects clinically meaningfully severity. Importantly, 99.55% of patients received dexamethasone and 96.36% received ondansetron, and therefore, the risks we assessed were based on a population already receiving dual antiemetic prophylaxis [19, 20].

A notable finding of this study was that the Apfel score was not significantly associated with PONV in this cohort (p=0.262), and none of its individual components was significantly associated with the outcome. The opioid component was assessed preoperatively rather than according to actual postoperative opioid administration, which may have further limited its predictive value. These findings should be interpreted cautiously. The marked imbalance in sex distribution, with women comprising 96.4% of the cohort, and the low prevalence of a history of motion sickness resulted in restricted variability for these variables and limited the ability to detect potential associations. The routine use of dexamethasone and ondansetron in nearly all patients may have further reduced variability in both baseline risk and observed PONV rates. The absence of statistically significant associations should therefore not be interpreted as evidence that these established risk factors are unrelated to PONV; rather, their discriminatory value could not be assessed reliably in this highly selected, predominantly high-risk cohort. Our observation is not without precedent. When the Apfel and Koivuranta scores were validated in an independent cohort of 1,388 surgical inpatients, both discrimination and calibration proved weaker than earlier reports had suggested [24]. Preoperative anxiety, often proposed as an additional modifier of PONV risk, was likewise not associated with outcome in our cohort [25]. In this cohort the Apfel score did not identify the patients who developed PONV; whether it retains discriminatory value in rhytidectomy populations with a wider distribution of risk factors remains to be determined. Our findings have been partially corroborated by Eryilmaz et al. [15], who found surgical site to be a significant determinant of PONV in aesthetic surgery while postoperative opioid use and a history of motion sickness were not. In a retrospective cohort of 10,231 patients undergoing ambulatory eye, head, and neck surgery, Xiao et al. similarly reported that the factors associated with nausea and vomiting differed from those anticipated by current guidelines [18]. Furthermore, a quality-improvement study reported that implementing Apfel-guided prophylaxis did not reduce PONV rates, although a lack of reduction after an intervention does not in

itself indicate that the score lacks predictive value [26]. High PONV rates despite prophylaxis have also been reported in bariatric surgery, where PONV occurred in 82% of patients [27].

The strong association between concurrent blepharoplasty and PONV (OR: 5.674) is a notable finding. One possible explanation is stimulation of reflex pathways in close proximity to the operative field. The oculocardiac (oculo-emetic) reflex may be involved as a trigeminovagal arc in which periorbital manipulation and traction on the globe activate afferent trigeminal fibers. Strabismus surgery, where traction on the extraocular muscles engages this same afferent pathway, is well known for a high incidence of postoperative vomiting [28]. However, evidence is inconsistent. In a multicenter cohort of 3,152 children undergoing strabismus surgery, manipulation of the inferior oblique muscle was associated with an increased risk of postoperative vomiting, whereas the oculocardiac reflex itself was not [29]. These studies suggest that periorbital manipulation rather than the reflex arc itself may be the more relevant contributor to emesis. It is also possible that concurrent blepharoplasty extends the surgical intervention in both time and area, which may in turn be associated with a greater likelihood of PONV. However, duration of surgery was one of the adjusted factors in the multivariable model and variance inflation factors of 1.027 indicate no meaningful collinearity between these variables. The persistence of the association after adjustment for operative duration suggests that the relationship between concurrent blepharoplasty and PONV cannot be explained solely by longer operative time.

Duration of surgery (OR: 1.013/minute) was the second independent predictor. This coefficient indicates that each additional 60 minutes of surgery was associated with approximately 2.2-fold higher odds of PONV. This association is consistent with previous reports. In the series by Trimas and Trimas, most patients who developed PONV had undergone surgery lasting longer than 90 minutes, although this difference did not reach statistical significance, possibly because of the small sample size [17]. In a retrospective case-control study of 1670 ambulatory surgical patients, an operative duration exceeding one hour was an independent predictor of PONV (adjusted OR 1.554),

alongside female sex and postoperative pain [30]. In surgeries involving the eye, head, and neck, every additional minute of inhalational anesthesia increased the odds of PONV by approximately 1% [18], which is almost identical to the estimate we obtained. Consistent with this, the reported incidence of PONV in adults rises from roughly 2.8% for procedures shorter than 30 minutes to 27.7% for those exceeding three hours [4]. In relation, intravenous fluid replacement and estimated blood loss were both significant in univariate analysis but lost significance in the multivariable model. This can be explained by the strong possibility that these variables are directly linked to the duration of surgery.

Given the high incidence observed despite dual prophylaxis, strategies extending beyond two agents may warrant evaluation in this setting, particularly for prolonged or combined procedures. A single preoperative dose of aprepitant has been reported to reduce immediate PONV from 15.5% to 1.8% in facial plastic surgery patients [17], and multimodal regimens combining agents from several classes have been proposed for patients at very high risk [31]. Opioid-sparing and opioid-free anesthetic techniques, including the propofol-ketamine regimens developed for office-based aesthetic surgery, have also been associated with lower PONV rates than triple prophylaxis alone [32, 33]. None of these approaches was evaluated in the present study, and their efficacy in rhytidectomy remains to be established.

Limitations

Our study has several limitations. First, because of its retrospective and single-center design, causal inference cannot be made, and the generalizability of the findings to different surgical practices is limited. Second, PONV was assessed through routine clinical records and follow-up strictly ended at 24 hours. Post-discharge nausea and vomiting was not captured and might have been used to categorize risks [34]. Third, all patients received sevoflurane-based maintenance, so the contribution of the anesthetic maintenance technique could not be evaluated within this cohort. Because propofol-based total intravenous anesthesia is associated with a lower PONV incidence than inhalational

maintenance in large meta-analyses [35], the uniform use of a volatile agent may have contributed to the high incidence observed and limits the generalizability of our findings to centers using total intravenous anesthesia. The technical subtype of rhytidectomy (superficial musculoaponeurotic system [SMAS], deep plane, or mini facelift) was also not recorded. Possible genetic factors were also lacking in the data set [36]. Fourth, patients with incomplete perioperative records were excluded, which may have introduced selection bias. We also had no data on postoperative hematoma and other surgical complications, so the relationship between PONV and the surgical outcomes could not be tested. Finally, patient satisfaction was assessed using a single-item Likert question rather than a validated scale.

Conclusions

Despite routine dexamethasone and ondansetron prophylaxis, PONV occurred in approximately two-thirds of patients undergoing facelift surgery, and nearly half of the cohort vomited within the first 24 postoperative hours. Neither the classic patient-related risk factors nor the Apfel score was significantly associated with PONV in this cohort, although the narrow distribution of these factors limits the conclusions that can be drawn. Concurrent blepharoplasty and operative duration were the only factors independently associated with PONV, and PONV was accompanied by a longer hospital stay and markedly lower patient satisfaction. These findings suggest that facelift surgery may warrant being approached as a high-risk procedure for PONV irrespective of individual risk scores, particularly for prolonged and combined operations. Prospective studies are required to determine whether prophylaxis intensified beyond two agents, or opioid-sparing anesthetic strategies, reduce PONV in this population.

List of abbreviations

ASA, American Society of Anesthesiologists; CI, confidence interval; OR, odds ratio; PONV, postoperative nausea and vomiting; SMAS, superficial musculoaponeurotic system; SSRI/SNRI,

selective serotonin reuptake inhibitor/serotonin-norepinephrine reuptake inhibitor; STROBE, Strengthening the Reporting of Observational Studies in Epidemiology; VAS, visual analogue scale; VIF, variance inflation factor.

Declarations

Ethics approval and consent to participate

All procedures performed in this study involving human participants received ethical approval from the competent authorities, as described in the appropriate section of the manuscript, and have been conducted in accordance with the 1964 Helsinki Declaration and its later amendments. The study was approved by the Memorial Bahçelievler Hospital Ethics Committee on 25 August 2026 (approval number 179; chairperson: Prof. Dr. Mustafa Kürklü). The requirement for informed consent was waived by the Ethics Committee because of the retrospective nature of the study and the use of de-identified data, as described in the appropriate section of the manuscript.

Consent for publication

Not applicable.

Clinical trial number: not applicable.

Availability of data and materials

The data associated with the paper are available from the corresponding author upon reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

VA contributed to conceptualization, study design, data collection, analysis or interpretation, literature review, manuscript writing and critical review. YY contributed to conceptualization and literature review. PEÖ contributed to study design, analysis or interpretation and critical review. CİD contributed to data collection and analysis or interpretation. All authors read and approved the final version of the manuscript.

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Table 1. Preoperative patient characteristics and risk factors with regard to postoperative nausea and vomiting

Variable	Total (n=220)	PONV-Yes (n=137)	PONV-No (n=83)	P value
Age	48.11 ± 11.13	48.42 ± 10.32	47.59 ± 12.40	0.608
Female	212 (96.36%)	134 (97.81%)	78 (93.98%)	0.157
Male	8 (3.64%)	3 (2.19%)	5 (6.02%)	
Body mass index, kg/m²	24.28 ± 3.17	24.22 ± 2.95	24.38 ± 3.51	0.716
ASA I	121 (55.00%)	75 (54.74%)	46 (55.42%)	1.000
ASA II	97 (44.09%)	61 (44.53%)	36 (43.37%)	
ASA III	2 (0.91%)	1 (0.73%)	1 (1.20%)	
Menopause	85 (38.64%)	55 (40.15%)	30 (36.14%)	0.654
Smoking	65 (29.55%)	39 (28.47%)	26 (31.33%)	0.766
Alcohol use	102 (46.36%)	60 (43.80%)	42 (50.60%)	0.400
Oral contraceptive use	26 (11.82%)	12 (8.76%)	14 (16.87%)	0.112
Hormone replacement therapy	27 (12.27%)	17 (12.41%)	10 (12.05%)	1.000
SSRI/SNRI use	72 (32.73%)	51 (37.23%)	21 (25.30%)	0.093
Chronic opioid use	12 (5.45%)	5 (3.65%)	7 (8.43%)	0.140
Chronic antiemetic use	6 (2.73%)	4 (2.92%)	2 (2.41%)	1.000
Anxiety VAS score	2 (1-3)	2 (1-3)	2 (1-3)	0.258
Prior PONV history	49 (22.27%)	33 (24.09%)	16 (19.28%)	0.507
Motion sickness	7 (3.18%)	5 (3.65%)	2 (2.41%)	0.713
Apfel score 0	2 (0.91%)	0 (0.00%)	2 (2.41%)	0.262
Apfel score 1	47 (21.36%)	28 (20.44%)	19 (22.89%)	
Apfel score 2	132 (60.00%)	85 (62.04%)	47 (56.63%)	
Apfel score 3	38 (17.27%)	24 (17.52%)	14 (16.87%)	
Apfel score 4	1 (0.45%)	0 (0.00%)	1 (1.20%)	

Descriptive statistics are presented using mean ± standard deviation for normally distributed continuous variables, median (25th percentile - 75th percentile) for non-normally distributed continuous variables, and frequency (percentage) for

categorical variables. ASA: American Society of Anesthesiologists, PONV: postoperative nausea and vomiting, SSRI/SNRI: selective serotonin reuptake inhibitor / serotonin-norepinephrine reuptake inhibitor, VAS: visual analogue scale.

Table 2. Operative, anesthetic, and antiemetic prophylaxis characteristics with regard to postoperative nausea and vomiting

Variable	Total (n=220)	PONV-Yes (n=137)	PONV-No (n=83)	P value
Accompanying head or neck surgery[a]	144 (65.45%)	105 (76.64%)	39 (46.99%)	<0.001
Blepharoplasty	86 (39.09%)	73 (53.28%)	13 (15.66%)	<0.001
Fat injection	48 (21.82%)	37 (27.01%)	11 (13.25%)	0.026
Lip lift	30 (13.64%)	24 (17.52%)	6 (7.23%)	0.051
Neck lift	16 (7.27%)	7 (5.11%)	9 (10.84%)	0.187
Eyebrow lift	11 (5.00%)	10 (7.30%)	1 (1.20%)	0.056
Rhinoplasty	10 (4.55%)	8 (5.84%)	2 (2.41%)	0.326
Duration of operation (min)	310.41 ± 91.93	344.19 ± 79.52	254.65 ± 83.84	<0.001
Fentanyl use	209 (95.00%)	132 (96.35%)	77 (92.77%)	0.339
Fentanyl dose (mcg)	100 (100-100)	100 (100-100)	100 (100-100)	0.240
Tramadol use	123 (55.91%)	81 (59.12%)	42 (50.60%)	0.274
Tramadol dose (mg)	75 (0-100)	100 (0-100)	50 (0-100)	0.081
Intravenous fluid replacement (mL)	2650 (2250-2950)	2800 (2450-3200)	2350 (1850-2700)	<0.001
Blood loss (mL)	100 (100-150)	125 (100-150)	100 (75-125)	<0.001
Local anesthetics use	101 (45.91%)	59 (43.07%)	42 (50.60%)	0.343
Epinephrine use	158 (71.82%)	100 (72.99%)	58 (69.88%)	0.732
Ondansetron use	212 (96.36%)	135 (98.54%)	77 (92.77%)	0.055
Dexamethasone use	219 (99.55%)	137 (100.00%)	82 (98.80%)	0.377
Scopolamine use	4 (1.82%)	4 (2.92%)	0 (0.00%)	0.300

[a] Patients may have more than one of the listed concurrent procedures. Concurrent bichectomy (n=4), forehead lift (n=1), and jaw implant (n=1) were also recorded; none was associated with PONV (p=1.000 for each) and they are not shown. PONV: postoperative nausea and vomiting.

Table 3. Postoperative outcomes with regard to postoperative nausea and vomiting

Variable	Total (n=220)	PONV-Yes (n=137)	PONV-No (n=83)	P value
Nausea VAS score	3 (0-5)	4 (3-6)	0 (0-0)	—
Vomiting	108 (49.09%)	108 (78.83%)	0 (0.00%)	—
Rescue antiemetic use	127 (57.73%)	127 (92.70%)	0 (0.00%)	<0.001
Dizziness	103 (46.82%)	103 (75.18%)	0 (0.00%)	<0.001
Postoperative opioid use	65 (29.55%)	34 (24.82%)	31 (37.35%)	0.068
Length of stay in hospital, h	44.87 ± 8.10	48.31 ± 6.79	39.19 ± 6.80	<0.001
Satisfaction: very dissatisfied	24 (10.91%)	24 (17.52%)	0 (0.00%)*	<0.001

Variable	Total (n=220)	PONV-Yes (n=137)	PONV-No (n=83)	P value
dissatisfied	50 (22.73%)	50 (36.50%)	0 (0.00%)*	
neutral	34 (15.45%)	34 (24.82%)	0 (0.00%)*	
satisfied	41 (18.64%)	26 (18.98%)	15 (18.07%)	
very satisfied	71 (32.27%)	3 (2.19%)	68 (81.93%)*	

Patient satisfaction was assessed at the 24th postoperative hour using a 5-point Likert scale. Nausea VAS score and vomiting form part of the definition of the primary outcome and are shown for descriptive purposes only. PONV: postoperative nausea and vomiting, VAS: visual analogue scale. * Statistically significant category within the comparison of the five-category satisfaction distribution.

Table 4. Significant factors independently associated with postoperative nausea and vomiting, multivariable logistic regression analysis

Variable	β coefficient	Standard error	P value	OR	95% CI for OR
Accompanying blepharoplasty, Yes	1.736	0.378	<0.001	5.674	2.704-11.905
Duration of operation, min	0.013	0.002	<0.001	1.013	1.009-1.018
Constant	-4.023	0.717	<0.001	0.018	-

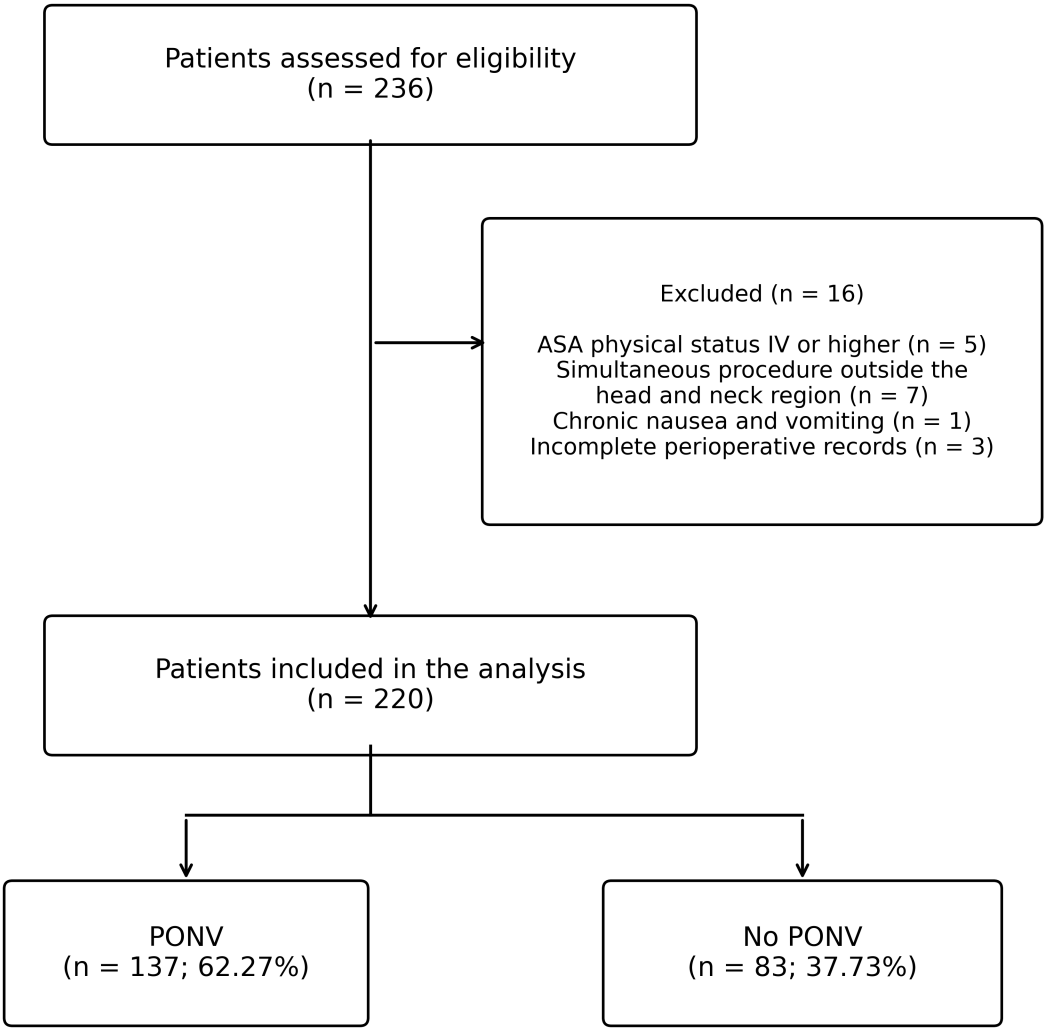
Nagelkerke pseudo-R^2 = 0.413. OR: Odds ratio, CI: Confidence interval, VIF: Variance inflation factor (both retained variables: 1.027). Variables entered into the model but not retained in the final model: SSRI/SNRI use (p=0.091), accompanying any head or neck surgery (p=0.205), accompanying fat injection (p=0.772), accompanying lip lift (p=0.921), accompanying eyebrow lift (p=0.248), tramadol dose (p=0.926), IV fluid replacement (p=0.198), blood loss (p=0.094), and intraoperative ondansetron use (p=0.172).

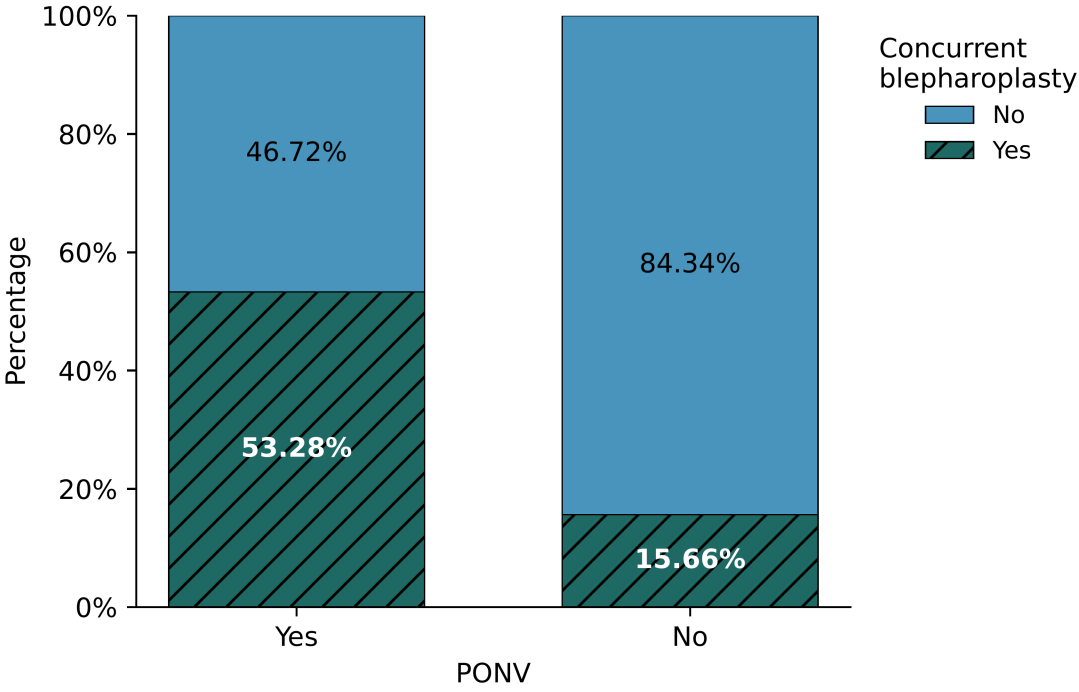
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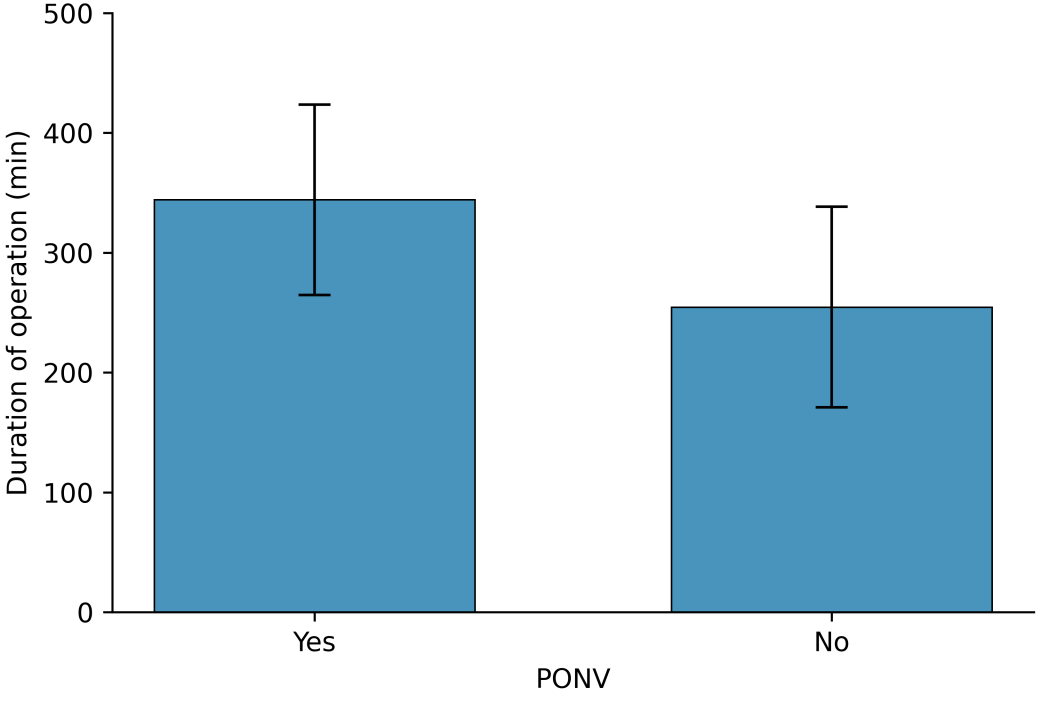
Fig. 1. Flow of patients through the study. ASA: American Society of Anesthesiologists; PONV: postoperative nausea and vomiting.

Fig. 2. Proportion of patients with concurrent blepharoplasty within each PONV group. Bars show the percentage of patients in each PONV group who underwent concurrent blepharoplasty (53.28% of the PONV group and 15.66% of the non-PONV group); the denominator is therefore the PONV group, not the blepharoplasty group. Read in the other direction, PONV occurred in 84.88% of patients who underwent concurrent blepharoplasty and in 47.76% of those who did not. PONV: postoperative nausea and vomiting.

Fig. 3. Duration of operation with regard to PONV. Bars show the group mean and error bars represent one standard deviation (PONV present, 344.19 ± 79.52 minutes; PONV absent, 254.65 ± 83.84 minutes; $p<0.001$). PONV: postoperative nausea and vomiting.


Patients assessed for eligibility
(n = 236)
Excluded (n = 16)
ASA physical status IV or higher (n = 5)
Simultaneous procedure outside the head and neck region (n = 7)
Chronic nausea and vomiting (n = 1)
Incomplete perioperative records (n = 3)
Patients included in the analysis
(n = 220)
PONV
(n = 137; 62.27%)
No PONV
(n = 83; 37.73%)


100%
80%
60%
40%
20%
0%
Percentage
46.72%
53.28%
84.34%
15.66%
Yes
No
PONV
Concurrent blepharoplasty
No
Yes


500
400
300
200
100
0
Duration of operation (min)
Yes
No
PONV