

Incidence and Risk Factors of Postoperative Nausea-Vomiting after Implementation of Prophylaxis Guideline

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Abstract

Introduction: Postoperative nausea-vomiting (PONV) is one of the major complications in patients undergoing general anesthesia with incidence between 20% and 30%. PONV can cause serious problems. Our department has developed and implemented a PONV prophylaxis guideline for high risk PONV patients since 2013, however, PONV still presents.

Objective: To identify the incidence and risk factors of PONV after implementation of PONV prophylaxis guideline.

Methods: A retrospective study was performed in 443 adult patients undergoing elective surgery under general anesthesia in Srinagarind Hospital from January 2014 to December 2014 to identify the incidence and risk factors of PONV. From literature review, we identified 20 risk factors for PONV. All relevant risk factors were assessed

for crude odds and adjusted odds ratios using binary logistic regression analysis to identify the relevant risk factors.

Results: The incidence of PONV was 10.8%. Female gender had a risk ratio of 2.663 (95% CI: 1.350-5.255). Patients who had postoperative numeric pain score (NRS) ≥ 5 had risk ratio of 2.040 (95% CI: 1.084-4.228). Interestingly, combined general anesthetic technique with spinal or epidural block could reduce PONV with risk ratio of 0.278 (95% CI: 0.100-0.777).

Conclusion: After implementation of PONV prophylaxis guideline, the incidence of PONV is 10.8%. The risk factors for PONV are female gender and postoperative NRS ≥ 5 , while combined general anesthesia with spinal or epidural block reveals protective effect.

Keywords: postoperative nausea-vomiting, PONV, prophylaxis guideline, risk factor

Introduction

Postoperative nausea-vomiting (PONV) is one of the most common complications in patients undergoing general anesthesia.¹⁻³ PONV can cause serious problems e.g., increased intracranial pressure, suture line disruption,

wound dehiscence, electrolyte abnormality, and aspiration of gastric content, which lead to prolonged length of stay in intensive care and hospital.⁴⁻⁶ The incidence of PONV in patients undergoing general anesthesia using inhalation anesthetics ranges between 20% and 30%.^{6,7} For this reasons, our department has developed

a PONV prophylaxis guideline for high risk patients from literature review.^{3,6,8} We identified 5 major risk factors for PONV, i.e., 1) female gender; 2) non-smoking; 3) undergoing general anesthesia; 4) previous history of PONV or motion sickness; and 5) laparoscopic/ear/thyroid surgery. Patients identified as high-risk if they have >3 risk factors, or with 4) of 5) will receive PONV prophylaxis with dexamethasone 4 mg and ondansetron 4 mg, intraoperatively. After implementation of the guideline in 2013, nevertheless, PONV still presents. Identifying risk factors for PONV may lead to improvement in patient management, shorten hospital stay, and better quality of life of the patients.

Objective

To identify the incidence and risk factors of PONV after implementation of PONV prophylaxis guideline.

Methods

This study was approved by Khon Kaen University Ethic Committee in Human Research (HE581153). This was a retrospective, descriptive, and analytical study.

The inclusion criteria were: (1) adult patients who underwent elective surgery under general anesthesia, (2) age 18-65 years old, and (3) ASA I-IV. Exclusion criteria were: (1) incomplete medical records, (2) patients who had chronic use of anti-emetic drug.

Statistical analysis

First of all, we performed an extensive literature review for relevant risk factors that could be related to PONV and got 20 risk factors.^{2,6,9-13} Sample size was calculated

according to Tabachnick & Fidell which suggested that n should ideally be $10(k)+50$ where k is number of risk factors.¹⁴ The calculated samples size was 250. For more accuracy, we collected data from 443 anesthetic records in Srinagarind Hospital from January 2014 to December 2014. The categorical data were reported as number (n) and percentage (%), and the continuous data were reported as mean $\pm$ standard deviation (SD) or median (interquartile range) as appropriate. The differences between both groups were analysed using unpaired Student's t -test, Mann-Whitney U test, Chi-square test, or Fisher exact test where appropriate. $P < 0.05$ was indicated as statistical significance. Risk factors were analyzed using binary logistic regression analysis. The factors with P value < 0.1 were evaluated for AUC and crude odds ratio. Finally, the adjusted odds ratios were calculated. All statistical analyses were performed using SPSS 16.0 (SPSS, Chicago, IL, USA).

Results

From 443 patients, we identified 48 with PONV. The incidence of PONV was 10.8%. Demographic, clinical data, and risk factors for PONV including P value of 443 patients were presented in Table 1.

Area under the receiver operating characteristic curve (AUC) and crude odds ratios from univariate analysis of relevant risk factors with P value < 0.1 were shown in Table 2. From univariate analysis, we identified 5 potentially relevant risk factors for PONV i.e., female gender, nonsmoking, combined general anesthesia technique, nitrous oxide, and postoperative pain score ≥ 5 (Table 2).

Table 1 Demographic and clinical data

	Total (n=443)	PONV (n=48)	No PONV (n=395)	P value
Female	234 (52.8)	35 (72.9)	199 (50.4)	0.003
Age (yr)	46.0± 5.5	45.2±15.0	46.1±15.5	0.715
Body weight (kg)	60.4±12.1	60.5±11.2	60.4±12.3	0.958
Height (m)	1.6±0.1	1.6±0.1	1.6±0.1	0.087
ASA-PS classification				
I	200 (45.1)	22 (45.8)	178 (45.1)	0.157
II	172 (38.8)	24 (50.0)	148 (37.5)	
III	55 (12.4)	2 (4.2)	53 (13.4)	
IV	16 (3.7)	0 (0)	16 (4.0%)	
Systolic blood pressure (mmHg)	125.7±18.1	126.1±14.9	125.7±18.5	0.863
Smoking	87 (19.6)	4 (8.3)	83 (21.0)	0.035
Previous PONV	7 (1.6)	2 (4.2)	5 (1.3)	0.170
Duration of anesthesia (min)	135.9±73.3	147.3±69.2	134.6±73.8	0.256
Technique of anesthesia				
Combined GA technique	150 (33.9)	5 (10.4)	145 (36.7)	< 0.001
Spinal morphine	21 (4.7)	2 (4.2)	19 (4.8)	0.933
Intraoperative variables				
Morphine (mg)	3.8±2.6	3.9±1.7	3.8±2.7	0.876
Fentanyl (µg)	53.2±37.9	52.9±28.0	53.2±39.6	0.968
Propofol (mg)	136.5±93.9	133.6±40.9	136.9±98.6	0.825
Sevoflurane	364 (82.2)	41 (85.4)	323 (81.8)	0.016
Desflurane	66 (14.9)	9 (18.8)	57 (14.4)	0.634
N ₂ O	127 (28.7)	20 (41.7)	107 (27.1)	0.035
Fluid intake (mL)	750 (950)	800 (1,325)	750 (920)	0.944
Estimated blood loss (mL)	30 (140)	50 (180)	30 (140)	0.119
Postoperative medications				
Morphine (mg)	5.2±2.9	5.4±3.2	5.2±2.9	0.770
Fentanyl (µg)	48.7±28.7	55.0±36.1	47.2±26.7	0.223
Pain score	3.8±3.7	5.7±3.6	3.6±3.7	< 0.001

Data are presented as n (%), mean±SD, or median (interquartile range).

ASA-PS = American Society of Anesthesiologists physical status, O₂ = oxygen, CVT = cardiovascular and thoracic, ENT = ear-nose-throat, GA = general anesthesia, N₂O = nitrous oxide

Table 2 AUC and crude odds ratios of relevant risk factors

	AUC	Crude odds	95% CI		P value
			Lower	Upper	
Female gender	0.613	2.652	1.362	5.164	0.004
Nonsmoking	0.563	2.926	1.022	8.377	0.045
Combined GA technique	0.631	0.200	0.078	0.518	0.001
N ₂ O	0.573	1.923	1.039	3.557	0.037
Postoperative pain score ≥ 5	0.643	3.385	1.737	6.593	< 0.001

AUC = area under receiver operating characteristic curve, CI = confidence interval, GA = general anesthesia, N₂O = nitrous oxide

Following multivariate analysis, three factors were identified and calculated for adjusted odds ratio (Table 3). Female gender had a risk ratio of 2.663 (95% CI: 1.350–5.255). Postoperative numeric pain score (NRS) ≥ 5 had a risk ratio of 2.040 (95% CI: 1.084–4.228). Interestingly, combined general anesthetic technique with spinal or epidural block could reduce PONV with a risk ratio of 0.278 (95% CI: 0.100–0.777).

Discussion

The incidence of PONV in this study is 10.8% which is lower than previous studies.^{6,7} The explanation is that this incidence was identified in patients receiving PONV prophylactic medication. This shows that PONV prophylaxis can reduce the incidence of PONV to some degree. Our result is similar to the study of Dewinter and colleagues which revealed that applying a simplified prophylaxis algorithm for PONV (female patients receiving triple prophylaxis: dexamethasone and ondansetron plus either propofol or droperidol; male patients receiving double prophylaxis: dexamethasone and

ondansetron) can reduce PONV within 24 h (22% vs. 33%, $P=0.02$).¹⁵ Although we have implemented PONV prophylaxis guideline for high-risk patients, unfortunately PONV still presented. This study revealed that after implementation of prophylaxis guideline, the risk factors for PONV were female gender and postoperative NRS ≥ 5 while combined general anesthesia with spinal or epidural block revealed protective effect. The results of this study are similar to many studies. Female gender has been identified as a major risk factor for PONV since the early development of risk score for predicting PONV and this risk factor is unmanageable.⁶ Hence, it is worth to give prophylactic antiemetic drugs to all female patients undergo high risk surgery.

Our study also showed that combined general anesthesia with spinal or epidural block reduced PONV. Epidural block in abdominal surgery accelerates the bowel transit which may contribute to the reduction in PONV.^{16,17} However, the result of this study is different from systematic reviews which show that epidural block does not reduce the incidence of PONV.^{16,17} We

Table 3 Adjusted odds ratios and 95% CI of relevant risk factors

	Adjusted odds ratio	95% CI	
		Lower	Upper
Female	2.663	1.350	5.255
Postoperative pain score ≥ 5	2.040	1.084	4.228
Combined GA	0.278	0.100	0.777

CI = confidence interval, GA = general anesthesia

found that postoperative NRS ≥ 5 related with PONV. Many studies revealed that well controlled postoperative pain with opioid-sparing multimodal analgesia resulted in reduced PONV.¹⁸

From the result, the modifiable risk factors are pain control and choice of anesthesia. Optimized pain control with pain score lower than 5 should be considered in all patients who undergo general anesthesia. The type of opioid and opioid preoperative consumption has no statistical significances for PONV.

On the other hand, combined general spinal or epidural block revealed the protective effect. Thus, we suggest that combined anesthetic technique should be performed in patient who has no contraindication for superior pain control and reduction of PONV.

Conclusion

After implementation of PONV prophylaxis guideline for high risk PONV patients, the incidence of PONV is 10.8%. The risk factors for PONV were female gender and postoperative NRS ≥ 5 , while combined general anesthesia with spinal or epidural block revealed the protective effect. Thus, applying the prophylaxis guideline to every female patient, providing adequate postoperative pain control, and implementing

combined general anesthesia where applicable may further lower the incidence of PONV.

Competing interests

The authors have no competing interests.

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