International Journal of Medical and Pharmaceutical Research

Online ISSN-2958-3683 | Print ISSN-2958-3675
Frequency: Bi-Monthly
Available online on: https://ijmpr.in/

Original Article

Comparison of Opioid-Free Anaesthesia Versus Opioid-Based Anaesthesia on Early Postoperative Recovery After Elective Laparoscopic Abdominal Surgery

Dr. Yetigadda Dinesh Reddy[1], Dr. G. Venkata Krishna Reddy[2], Dr. Ch. Rajesh Reddy[3]

[1]Associate professor, Department of General Surgery, Dr VRK Women's Medical College, Hyderabad
[2]Associate professor, Department of Anaesthesiology, Fathima institute of Medical Sciences, Kadapa
[3]Associate Professor, Department of Anaesthesiology, PSP Medical College Hospital and Research Institute, Chennai

Corresponding Author:

Dr. G. Venkata Krishna Reddy
Associate professor, Department of Anaesthesiology, Fathima institute of Medical Sciences, Kadapa;
Email: krish7582@gmail.com

Received: 20-05-2026
Accepted: 09-06-2026
Available online: 30-06-2026

ABSTRACT

Background: Opioid-based anaesthesia (OBA) is commonly used for intraoperative analgesia; however, opioid administration is associated with adverse effects like postoperative nausea and vomiting (PONV), sedation, respiratory depression, ileus, and delayed recovery. Opioid-free anaesthesia (OFA) uses multimodal non-opioid analgesic strategies to provide adequate analgesia while minimizing opioid-related complications.

Aim: To compare the effect of opioid-free anaesthesia with opioid-based anaesthesia on early postoperative recovery in patients undergoing elective laparoscopic abdominal surgery.

Methods: This prospective randomized controlled study was done in the Department of Anaesthesiology at a tertiary care teaching hospital. One hundred patients aged 18–65 years with ASA physical status I and II scheduled for elective laparoscopic abdominal surgery under general anaesthesia were enrolled. Patients were randomly allocated into two groups: OFA group (n=50) and OBA group (n=50). Early postoperative recovery was assessed using the Quality of Recovery-15 (QoR-15) score at 24 hours. Secondary outcomes included postoperative pain assessment using Visual Analogue Scale (VAS), rescue analgesic requirement within 24 hours, and incidence of PONV.

Results: Baseline demographic and clinical characteristics were comparable between groups. The mean QoR-15 score at 24 hours was significantly more in the OFA group compared with the OBA group (132.8 ± 8.4 vs 122.5 ± 9.7; $p<0.001$). Good recovery was achieved in 70% of OFA patients compared with 38% of OBA patients ($p=0.001$). Mean VAS pain score was significantly lower in the OFA group (2.2 ± 0.9 vs 3.6 ± 1.1; $p<0.001$). Rescue analgesic requirement was lower in OFA patients (28% vs 62%; $p=0.001$). PONV incidence was also reduced in the OFA group (14% vs 34%; $p=0.019$).

Conclusion: Opioid-free anaesthesia provides superior early postoperative recovery with better pain control, reduced analgesic requirement, and lower incidence of PONV compared with opioid-based anaesthesia. OFA may be considered an effective component of enhanced recovery protocols for elective laparoscopic abdominal surgery.

Keywords: *Opioid-free anaesthesia; Opioid-based anaesthesia; Laparoscopic surgery; QoR-15; Postoperative recovery; Multimodal analgesia; PONV.*

INTRODUCTION

Effective perioperative pain management is the main component of enhanced recovery after surgery (ERAS) protocols, as it significantly affects postoperative recovery, patient satisfaction, and healthcare utilization. Opioid-based anaesthesia (OBA) was the cornerstone of intraoperative analgesia due to its analgesic properties and ability to attenuate the surgical

stress response. But the perioperative use of opioids is associated with adverse effects like postoperative nausea and vomiting (PONV), respiratory depression, ileus, urinary retention, sedation, opioid-induced hyperalgesia, and the potential for persistent postoperative opioid use. All these may delay recovery and prolong hospital stay.[1,2]

As there are concerns on opioid-related adverse effects and the global opioid crisis have prompted the exploration of opioid-sparing and opioid-free anaesthesia (OFA) techniques. Opioid-free anaesthesia is the avoidance of systemic opioids throughout the intraoperative period while maintaining adequate analgesia through multimodal pharmacological strategies. These commonly include agents such as dexmedetomidine, ketamine, lidocaine, magnesium sulfate, non-steroidal anti-inflammatory drugs (NSAIDs), acetaminophen, and regional anaesthetic techniques.[3,4] By targeting multiple pain pathways simultaneously, OFA aims to provide effective analgesia while minimizing opioid-related complications.

Laparoscopic abdominal surgery is the preferred approach for many elective abdominal procedures owing to its minimally invasive nature, reduced postoperative pain, shorter hospital stay, and faster functional recovery compared with open surgery. Patients commonly experience significant postoperative pain resulting from visceral manipulation, pneumoperitoneum, diaphragmatic irritation, and port-site incisions. Opioids are widely used to manage this pain, but their adverse effects may negate some of the advantages associated with minimally invasive surgery.[5,6]

Early postoperative recovery is recognized as a multidimensional outcome encompassing physical comfort, emotional well-being, physical independence, pain control, and patient support. Validated assessment tools like Quality of Recovery-15 (QoR-15) questionnaire provide a comprehensive evaluation of patient-centred recovery and have become widely accepted outcome measures in perioperative research. Improving early recovery after laparoscopic surgery is particularly important because it facilitates earlier ambulation, reduces postoperative complications, shortens hospital stay, and enhances patient satisfaction.

AIM AND OBJECTIVES:

Aim

To compare the effect of opioid-free anaesthesia with conventional opioid-based anaesthesia on early postoperative recovery in patients undergoing elective laparoscopic abdominal surgery.

Objectives

Primary Objective

- To compare early postoperative recovery between patients receiving opioid-free anaesthesia and those receiving conventional opioid-based anaesthesia using the Quality of Recovery-15 (QoR-15) score.

Secondary Objectives

- To compare postoperative pain intensity between the two groups using the Visual Analogue Scale (VAS).
- To compare total postoperative opioid/analgesic consumption within the first 24 hours after surgery.

MATERIALS AND METHODS

Study Design

- This prospective, randomized, controlled study was conducted in the Department of Anaesthesiology at a tertiary care teaching hospital after obtaining approval from the Institutional Ethics Committee and written informed consent from all participants.

Study Population

- 100 patients scheduled for elective laparoscopic abdominal surgery under general anaesthesia were enrolled in the study. The study was done for 6 months from September 2025 to February 2026.

Sample Size

One hundred patients were included and randomly allocated into two equal groups (n = 50 each).

- **Group OFA (n = 50):** Received opioid-free anaesthesia.
- **Group OBA (n = 50):** Received conventional opioid-based anaesthesia.

Sample Size Calculation

$$n = 2 \times (Z\alpha/2 + Z\beta)^2 \times \sigma^2 / d^2$$

Where:

- $Z\alpha/2$ = 1.96 (95% confidence level)
- $Z\beta$ = 0.84 (80% power)
- σ = 16 (standard deviation)
- d = 10.5 (expected difference in QoR-15 score)

Substituting the values:

$n = 2 \times (1.96 + 0.84)^2 \times (16)^2 / (10.5)^2$
$n = 2 \times (2.80)^2 \times 256 / 110.25$
$n = 2 \times 7.84 \times 256 / 110.25$
$n = 36.4$ patients per group
After adding a 20% allowance for dropouts, the required sample size was approximately 44 patients per group. To improve study power, 50 patients were included in each group.

Inclusion Criteria

- Patients aged 18–65 years.
- Either sex.
- American Society of Anesthesiologists (ASA) physical status I and II.
- Scheduled for elective laparoscopic abdominal surgery under general anaesthesia.
- Patients willing to provide written informed consent.

Exclusion Criteria

- ASA physical status III or IV.
- Allergy or contraindication to study drugs.
- Chronic opioid use or opioid dependence.
- Significant hepatic, renal, cardiac, or respiratory disease.
- Pregnancy or lactation.

Data Collection

The following parameters were recorded:

- Demographic data (age, sex, BMI, ASA status).
- Duration of surgery and anaesthesia.
- Intraoperative heart rate and mean arterial pressure at predefined intervals.
- Early postoperative recovery assessed using the Quality of Recovery-15 (QoR-15) score at 24 hours.
- Total postoperative analgesic/opioid consumption during the first 24 hours.
- Incidence of postoperative nausea and vomiting.

Statistical Analysis

Data were entered into Microsoft Excel and analysed using Statistical Package for the Social Sciences (SPSS) version 22.0. Frequencies and percentages are assessed. Comparison between groups was done by T test and chi square tests.
Ethical aspects: Informed consent was obtained from all subjects
.

RESULTS:

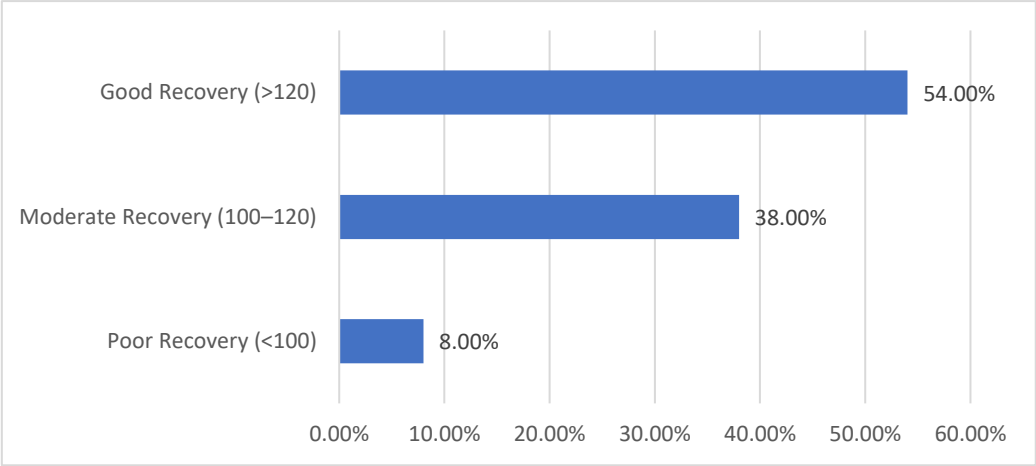
Demography:

29% of the patients were aged 31-40 years.
54% of the patients were female.
60% of the patients belonged to ASA I
55% of the patients underwent Laparoscopic Cholecystectomy.

Table 1. Baseline Demographic and Clinical Characteristics of the Study Participants (N = 100)

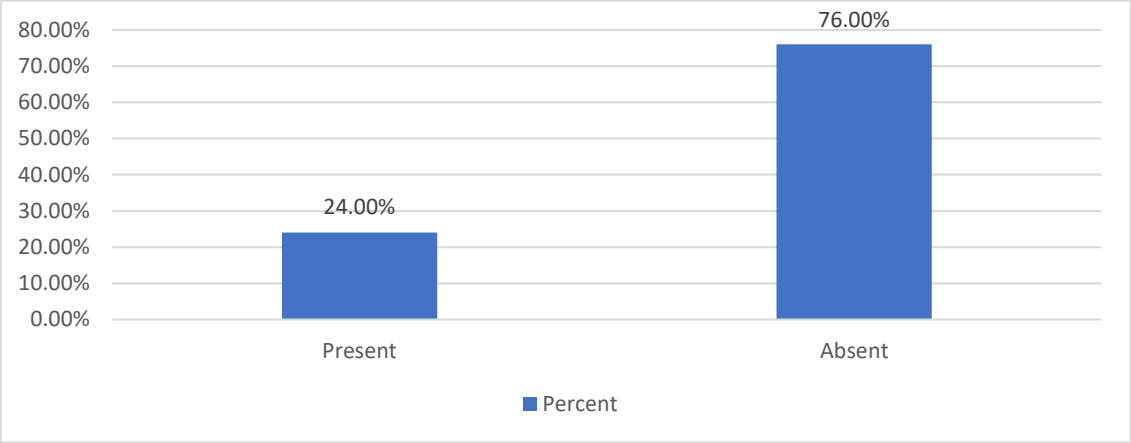
Characteristic	Category	Frequency (n)	Percentage (%)
Age Group (years)	18–30	18	18.0
	31–40	29	29.0
	41–50	27	27.0
	51–65	26	26.0
Gender	Male	46	46.0
	Female	54	54.0
ASA Physical Status	ASA I	60	60.0
	ASA II	40	40.0
Type of Surgery	Laparoscopic Cholecystectomy	55	55.0
	Laparoscopic Appendectomy	20	20.0
	Laparoscopic Hernia Repair	15	15.0
	Other Laparoscopic Abdominal Procedures	10	10.0

Distribution of Patients According to Quality of Recovery-15 (QoR-15) Score at 24 Hours
54% of the patients had good recovery.



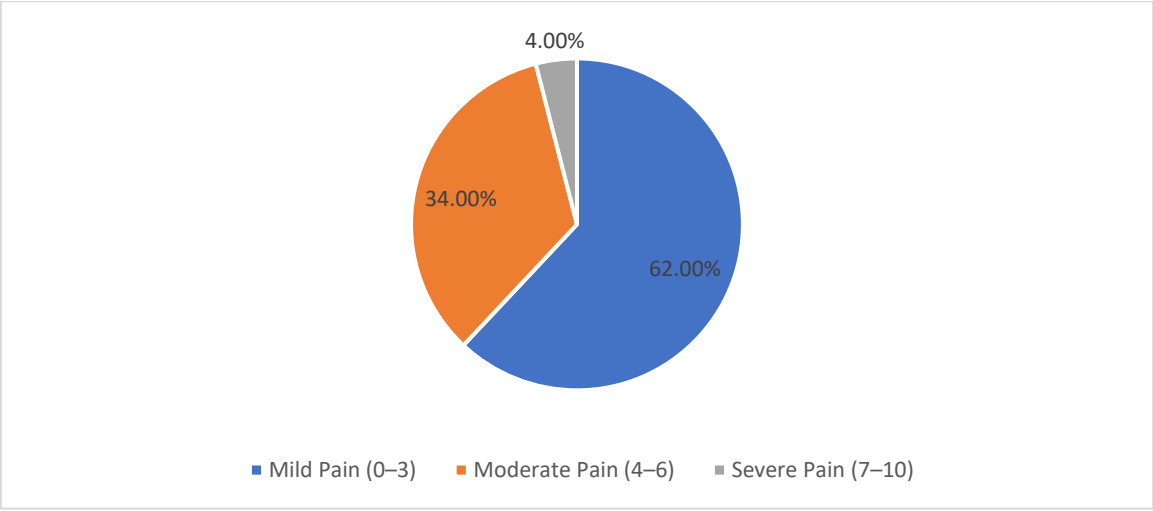
Graph 1: Recovery among patients

Distribution of Patients According to Postoperative Nausea and Vomiting (PONV)
24% of the patients had Postoperative Nausea and Vomiting.



Graph 3: Postoperative Nausea and vomiting

Distribution of Patients According to Postoperative Pain Score (VAS at 24 Hours)
62% of the patients had Mild pain.



Graph 4: Postoperative pain score

COMPARISON BETWEEN GROUPS

Baseline demographic and clinical characteristics were comparable between the two groups. The mean age was 41.2 ± 10.3 years in the OFA group and 40.8 ± 9.8 years in the OBA group, with no statistically significant difference (p = 0.84). Females constituted 54% of patients in both groups, and 60% of patients in each group belonged to ASA physical status I. The distribution of surgical procedures was also similar, with laparoscopic cholecystectomy being the most common operation in both groups (56% vs. 54%; p = 0.84).

Patients receiving opioid-free anaesthesia showed significantly better early postoperative recovery. The mean Quality of Recovery-15 (QoR-15) score at 24 hours was significantly higher in the OFA group compared to the OBA group (132.8 ± 8.4 vs. 122.5 ± 9.7; p < 0.001). Good recovery (QoR-15 ≥122) was seen in 70% of patients in the OFA group compared with 38% in the OBA group (p = 0.001).

Postoperative pain was significantly lower in the OFA group. The mean VAS pain score at 24 hours was 2.2 ± 0.9 in the OFA group compared with 3.6 ± 1.1 in the OBA group (p < 0.001). Mild postoperative pain (VAS 0–3) was seen in 76% of patients receiving OFA, 48% of patients in the OBA group had mild pain (p = 0.004).

The requirement for rescue postoperative analgesics within the first 24 hours was significantly lower in the OFA group (28%) compared to the OBA group (62%), and this difference was statistically significant (p = 0.001).

The incidence of postoperative nausea and vomiting (PONV) was also significantly lower among patients who received opioid-free anaesthesia (14% vs. 34%; p = 0.019), indicating a reduction in opioid-related adverse effects.

Variable	OFA (n=50)	OBA (n=50)	P value
Age (years), Mean ± SD	41.2 ± 10.3	40.8 ± 9.8	0.84
Female, n (%)	27 (54%)	27 (54%)	1.000
ASA I, n (%)	30 (60%)	30 (60%)	1.000
Laparoscopic Cholecystectomy, n (%)	28 (56%)	27 (54%)	0.84
QoR-15 Score at 24 h, Mean ± SD	132.8 ± 8.4	122.5 ± 9.7	<0.001
Good Recovery (QoR-15 ≥122), n (%)	35 (70%)	19 (38%)	0.001
VAS Score at 24 h, Mean ± SD	2.2 ± 0.9	3.6 ± 1.1	<0.001
Mild Pain (VAS 0–3), n (%)	38 (76%)	24 (48%)	0.004
Analgesic Requirement within 24 h, n (%)	14 (28%)	31 (62%)	0.001
PONV, n (%)	7 (14%)	17 (34%)	0.019

DISCUSSION:

The present study compared the effects of opioid-free anaesthesia (OFA) and opioid-based anaesthesia (OBA) on postoperative recovery, pain, analgesic requirement, and postoperative nausea and vomiting (PONV) in patients undergoing laparoscopic abdominal surgeries.[7]100 patients were included, with 50 patients allocated to each group. The baseline demographic and clinical characteristics were comparable between the two groups, indicating that both groups were well matched. The mean age was 41.2 ± 10.3 years in the OFA group and 40.8 ± 9.8 years in the OBA group (p = 0.84). Female patients constituted 54% of both groups, 60% of patients in each group were ASA I, and laparoscopic cholecystectomy was the most commonly performed procedure (56% in OFA vs 54% in OBA; p = 0.84). Similar baseline characteristics have been reported in previous studies evaluating opioid-free anaesthetic techniques, where comparable demographic and surgical profiles between groups allowed accurate assessment of postoperative outcomes.

The quality of postoperative recovery assessed using the Quality of Recovery-15 (QoR-15) score at 24 hours was better in patients receiving opioid-free anaesthesia.[8] The mean QoR-15 score was 132.8 ± 8.4 in the OFA group compared with 122.5 ± 9.7 in the OBA group (p < 0.001). Good recovery (QoR-15 ≥122) was achieved in 70% of patients in the OFA group compared with 38% in the OBA group (p = 0.001). These findings indicate that avoidance of opioids causes early postoperative recovery, better patient comfort, and faster return of functional ability. Same observations were reported by Myles et al., who showed that QoR-15 is a sensitive tool for assessing postoperative recovery and that reduced postoperative pain, nausea, and opioid-related adverse effects are associated with improved recovery scores.[9]

In the present study, postoperative pain scores were significantly lower in the OFA group compared with the OBA group.[9,10] The mean VAS score at 24 hours was 2.2 ± 0.9 in the OFA group and 3.6 ± 1.1 in the OBA group (p < 0.001). Mild postoperative pain (VAS 0–3) was seen in 76% of patients receiving OFA compared with 48% of patients receiving OBA (p = 0.004). These results demonstrate that opioid-free anaesthesia can provide effective analgesia despite avoidance of intraoperative opioids. Similar findings were reported by Doleman Brett et al., who found that opioid-free and opioid-

sparing anaesthetic techniques can maintain adequate analgesia while reducing opioid consumption and opioid-associated side effects.[10] The improved pain control in the OFA group may be attributed to multimodal analgesic approaches involving non-opioid medications, local anaesthetic techniques, and prevention of opioid-induced hyperalgesia.

The requirement for rescue analgesics within the first 24 hours was significantly lower in the OFA group compared with the OBA group.[11,12] Only 28% of patients in the OFA group required rescue analgesia compared with 62% in the OBA group ($p = 0.001$). This reduction suggests better sustained postoperative analgesic control following opioid-free anaesthesia. Same results were reported in enhanced recovery protocols, where opioid minimization was associated with reduced postoperative opioid requirements and improved patient satisfaction.

The incidence of postoperative nausea and vomiting was lower in the OFA group compared with the OBA group.[13] PONV occurred in 14% of patients receiving OFA compared with 34% of patients receiving OBA ($p = 0.019$). These findings support the role of opioid reduction in decreasing postoperative adverse effects. Gan Tong J. et al. identified perioperative opioid administration as one of the major modifiable risk factors for PONV and recommended opioid-sparing strategies as part of multimodal PONV prevention.[13]

The findings of the present study are consistent with previous evidence showing the benefits of opioid-free anaesthesia in improving postoperative recovery outcomes.[14] Patients receiving OFA showed significantly higher QoR-15 scores, reduced postoperative pain, decreased requirement for rescue analgesics, and lower incidence of PONV compared with patients receiving opioid-based anaesthesia. These results support the use of opioid-free anaesthesia as an effective strategy within enhanced recovery protocols, particularly for laparoscopic procedures where early mobilisation, reduced complications, and rapid return to normal activity are important goals.

CONCLUSION:

Overall, opioid-free anaesthesia provided superior early postoperative outcomes compared with opioid-based anaesthesia in laparoscopic abdominal surgeries, with improved quality of recovery, better pain control, reduced analgesic requirements, and lower incidence of PONV. Therefore, opioid-free anaesthesia may be considered an effective component of enhanced recovery protocols, particularly in minimally invasive surgeries where early mobilisation, patient comfort, and rapid discharge are important goals. Further large-scale randomized studies are recommended to establish standardized OFA protocols and evaluate long-term outcomes.

REFERENCES:

1. Kehlet H, Dahl JB. Anaesthesia, surgery, and challenges in postoperative recovery. Lancet. 2003;362(9399):1921-8.
2. Chou R, Gordon DB, de Leon-Casasola OA, Rosenberg JM, Bickler S, Brennan T, et al. Management of postoperative pain: a clinical practice guideline. J Pain. 2016;17(2):131-57.
3. Beloeil H. Opioid-free anaesthesia. Best Pract Res Clin Anaesthesiol. 2019;33(3):353-60.
4. Lavand'homme P, Estebe JP. Opioid-free anaesthesia: a different regard to anaesthesia practice. Curr Opin Anaesthesiol. 2018;31(5):556-61.
5. Wick EC, Grant MC, Wu CL. Postoperative multimodal analgesia pain management with nonopioid analgesics and techniques: a review. Anesthesiol Clin. 2017;35(2):e1-e15.
6. Schwenk ES, Mariano ER, Buvanendran A, Hurley RW, Wasan AD, Narouze S, et al. Consensus guidelines on the use of intravenous ketamine infusions for acute pain management from the American Society of Regional Anesthesia and Pain Medicine, the American Academy of Pain Medicine, and the American Society of Anesthesiologists. Reg Anesth Pain Med. 2018;43(5):456-66.
7. Hao C, Xu H, Du J, Zhang T, Zhang X, Zhao Z, Luan H. Impact of Opioid-Free Anesthesia on Postoperative Quality of Recovery in Patients After Laparoscopic Cholecystectomy: A Randomized Controlled Trial. Drug Des Devel Ther. 2023;17:3539-3547. doi:10.2147/DDDT.S439674.
8. Stark PA, Myles PS, Burke JA. Development and psychometric evaluation of a postoperative quality of recovery score: the QoR-15. Anesthesiology. 2013;118(6):1332-1340. doi:10.1097/ALN.0b013e318289b84b
9. Myles PS, Myles DB, Galagher W, et al. Minimal clinically important difference for three quality of recovery scales. *Anesthesiology.* 2016;125(1):39-45.
10. Doleman B, Read DJ, Lund JN, Williams JP. Preventive opioid-free and opioid-sparing analgesic strategies for postoperative pain management: systematic review and meta-analysis. *Br J Anaesth.* 2018;121(4):749-764.
11. Kehlet H, Dahl JB. The value of "multimodal" or "balanced analgesia" in postoperative pain treatment. *Anesth Analg.* 1993;77(5):1048-1056.
12. Beloeil H, Albaladejo P, Sion B, et al. Opioid-free anaesthesia: a new approach to anaesthesia practice. *Anaesth Crit Care Pain Med.* 2019;38(6):673-677.
13. Gan TJ, Belani KG, Bergese S, et al. Fourth Consensus Guidelines for the Management of Postoperative Nausea and Vomiting. *Anesth Analg.* 2020;131(2):411-448.
14. Apfel CC, Läärä E, Koivuranta M, Greim CA, Roewer N. A simplified risk score for predicting postoperative nausea and vomiting. *Anesthesiology.* 1999;91(3):693-700.