E-ISSN: 2616-3470
P-ISSN: 2616-3462

www.surgeryscience.com
2025; 9(2): 28-31
Received: 25-02-2025
Accepted: 27-03-2025

Wasnan M Saed Mohsin
Babylon Health Directorate, Babylon, Iraq

Hussein Mohammedali Hussein
Karbala Health Directorate, Karbala, Iraq

Ghazwan Abdulraheem A Abdulkareem
Al-Kut Health Directorate, Kut, Iraq

Corresponding Author:
Wasnan M Saed Mohsin
Babylon Health Directorate, Babylon, Iraq

Comparison between propofol alone and combination of propofol and dexamethasone in reduction postoperative nausea and vomiting in appendectomy surgery

Wasnan M Saed Mohsin, Hussein Mohammedali Hussein and Ghazwan Abdulraheem A Abdulkareem

DOI: https://doi.org/10.33545/surgery.2025.v9.i2.A.1193

Abstract
Background: Postoperative nausea and vomiting (PONV) remains a common and distressing complication following surgery, particularly after appendectomy. While propofol has inherent antiemetic properties, its effectiveness as a sole agent may be limited. Dexamethasone, a corticosteroid, has also demonstrated efficacy in reducing PONV when used adjunctively.
Aim: This study aimed to compare the effectiveness of propofol alone versus the combination of propofol and dexamethasone in preventing PONV in patients undergoing emergency appendectomy.
Methods: A total of 100 patients, aged 18-60 years and of either gender, undergoing emergency appendectomy were enrolled in this study, conducted from October to December 2013. Patients were randomly divided into two equal groups (n=50). Group A received propofol (1-2 mg/kg) as both an induction and antiemetic agent. Group B received the same dose of propofol along with dexamethasone (8 mg) administered preoperatively. The incidence of PONV was recorded postoperatively and compared between both groups.
Results: The results indicated that the combination of propofol and dexamethasone significantly reduced the incidence of PONV compared to the use of propofol alone. Patients in Group B experienced fewer episodes of nausea and vomiting, demonstrating superior antiemetic efficacy.
Conclusion: The findings support that while propofol has antiemetic effects, its combination with dexamethasone is significantly more effective in reducing postoperative nausea and vomiting following appendectomy. This combination should be considered in clinical practice for better PONV prophylaxis.

Keywords: Propofol, dexamethasone, antiemetic, appendectomy, postoperative nausea and vomiting

Introduction
Postoperative nausea and vomiting (PONV) are among the most distressing and frequently encountered complications following surgery performed under general anesthesia, with a reported incidence ranging between 20-30% in the general population [1]. The act of vomiting is a complex, coordinated reflex involving the vomiting center in the brainstem. This center integrates signals from peripheral and central sources—via afferent pathways of the vagus nerve, chemoreceptor trigger zone (CTZ), area postrema, and nucleus of the solitary tract. Several neurotransmitters play a key role in this reflex arc, including dopamine, histamine, and serotonin [1-4]. PONV significantly affects patient comfort and satisfaction and may lead to complications such as dehydration, electrolyte imbalance, increased pain, delayed recovery, and extended hospital stays. Nausea is defined as the subjective, unpleasant sensation that precedes vomiting [4], while retching refers to the rhythmic contraction of the respiratory muscles without expulsion of gastric contents [4]. Vomiting is the forceful ejection of stomach contents through the mouth [4]. Several risk factors contribute to PONV, including patient-specific variables, surgical procedures, anesthetic techniques, and postoperative care [1-4]. For instance, females are at higher risk than males [5], and individuals with a history of motion sickness or prior episodes of PONV are particularly susceptible due to a lower vomiting threshold [6]. Interestingly, cigarette smoking appears to provide a protective effect against PONV, likely due to antiemetic substances found in tobacco smoke [7]. Surgeries involving the inner ear, head, neck, or upper abdomen—such as laparoscopic cholecystectomy and thyroidectomy—are also associated with higher PONV rates [1-4].

Anesthetic-related factors include the choice of induction agents and the use of opioids or nitrous oxide (N_2O). Opioids, such as morphine and fentanyl, stimulate the central nervous system's opioid receptors and increase the risk of PONV [8]. N_2O exacerbates PONV by increasing catecholamine release and altering middle ear pressure, stimulating the vestibular system [8]. In contrast, propofol has shown a significantly lower incidence of PONV compared to inhalational anesthetics, making it a preferred induction and maintenance agent in high-risk patients [9]. Commonly used antiemetics include butyrophenones (e.g., droperidol), benzamides (e.g., metoclopramide), glucocorticoids (e.g., dexamethasone), clonidine, serotonin ($5\text{-}HT_3$) receptor antagonists, and propofol itself [1-4]. Dexamethasone, an inexpensive and effective agent with minimal adverse effects in single doses, exerts its antiemetic action potentially via inhibition of prostaglandin synthesis or altering blood-brain barrier permeability [10, 11]. Intravenous dexamethasone at doses of 4-8 mg has shown significant efficacy in PONV prophylaxis [10, 11]. Propofol (2,6-diisopropylphenol), a widely used intravenous anesthetic, has emerged as a potent antiemetic due to its modulatory effects on neurotransmitter systems, including dopaminergic and serotonergic pathways [12-14]. It exerts a dose-dependent inhibitory effect on $5\text{-}HT_3$ receptors, which are implicated in nausea and vomiting, and also influences the limbic system and vomiting center [13, 14]. These mechanisms explain its antiemetic properties, making it a dual-purpose agent in anesthetic management. This study aims to evaluate and compare the antiemetic efficacy of propofol alone and in combination with dexamethasone in reducing PONV in patients undergoing appendectomy.

Method

This prospective study was conducted at Al-Kadhmiya Teaching Hospital over a three-month period, from October 2013 to December 2013, after obtaining approval from the Scientific Council of Anesthesia of the Arab Board and formal permission from the hospital's anesthesia department. Informed consent was obtained from all patients prior to participation. A total of 100 adult patients, aged between 18-60 years, with American Society of Anesthesiologists (ASA) physical status I-II, of either gender, undergoing emergency appendectomy were enrolled. Exclusion criteria included patients who had received antiemetics or corticosteroids within 48 hours preoperatively, those with obesity, a history of motion sickness or previous PONV, pregnant or menstruating women, smokers, patients with contraindications to dexamethasone (e.g., uncontrolled diabetes mellitus, peptic ulcer disease, severe hypertension), and those with known drug allergies. Patients were randomized into two equal groups (n=50 each). Group I received propofol (1-2 mg/kg) for induction, while Group II received the same dose of propofol along with 8 mg of intravenous dexamethasone at induction. Standard anesthesia monitoring (ECG, SpO_2, non-invasive blood pressure) was applied in all cases. No premedication was given. Analgesia was provided using fentanyl (1-2 µg/kg IV). Suxamethonium (1 mg/kg) was used to facilitate intubation. Anesthesia was maintained with isoflurane (0.5-1.5%) in 100% oxygen, with muscle relaxation achieved using atracurium (0.25 mg/kg). At the end of surgery, neuromuscular blockade was reversed with atropine (0.015 mg/kg) and neostigmine (0.04 mg/kg), and patients were extubated upon awakening. Postoperative analgesia included wound infiltration with lidocaine 1% (10 mL) and intravenous paracetamol (1 g) as needed. Patients requiring morphine for pain relief were excluded due to its emetogenic potential. Each patient received 20 mL/kg Hartmann's solution postoperatively. Episodes of nausea, retching, and vomiting were recorded over the first 24 hours. Rescue antiemetic therapy with metoclopramide (10 mg IV) was provided when necessary.

Results

The postoperative incidence of nausea, vomiting, and combined nausea and vomiting (PONV) was assessed in both study groups during the first 24 hours following appendectomy.

Patients in Group I (propofol alone) experienced a higher overall incidence of PONV compared to Group II (propofol with dexamethasone). The severity of nausea was graded using a standardized scale [15]:

- Grade 1: mild
- Grade 2: moderate
- Grade 3: severe with retching

Vomiting severity was classified based on the number of episodes

- Grade 1: one episode
- Grade 2: two episodes
- Grade 3: three or more episodes

In Group I, a higher proportion of patients reported moderate to severe nausea (grades 2 and 3) compared to Group II, where most nausea episodes were mild. The number of vomiting episodes was also significantly higher in Group I, with several patients experiencing two or more episodes, whereas Group II had fewer patients reporting vomiting, and most experienced only one or no episode.

The total incidence of PONV (presence of either nausea, vomiting, or both) was markedly reduced in the group that received dexamethasone in addition to propofol. Patients in this group not only had fewer symptoms but also required less rescue antiemetic therapy (metoclopramide).

There were no statistically significant differences in demographic or intraoperative risk factors (e.g., age, gender, duration of surgery, anesthetic agents used) between the two groups ($p > 0.05$), indicating that the observed reduction in PONV was attributable to the addition of dexamethasone.

These results support the enhanced antiemetic effect of combining dexamethasone with propofol for patients undergoing appendectomy. As in table 1 and 2.

Table 1: Postoperative incidence of nausea, vomiting with nausea and total nausea and vomiting (P.O.N.V.) for patients undergoing appendectomy.

Parameter	Group I (n=50)-%	Group II(n=50)-%
Nausea only	22% (11)	14% (7)
Vomiting with nausea	16% (8)	6% (3)
P.O.N.V.	38% (19)	20% (10)
Rescue antiemetic	12	7

Statically significant difference (p value 0.047).

Table 2: Postoperative nausea severity, retching/vomiting severity, for 100 patients undergoing appendectomy

Parameter	score	Group 1(n.=50)	Group 2(n.=50)
Nausea severity	1	6	4
	2	4	1
	3	1	2
Retching/vomiting severity	1	4	2
	2	2	0
	3	2	1

Discussion

The etiology of postoperative nausea and vomiting (PONV) is multifactorial, involving a combination of patient-specific, surgical, anesthetic, and postoperative factors. Key contributors include age, gender, history of motion sickness or previous PONV, menstrual status, smoking habits, the nature and duration of the surgical procedure, anesthetic technique, and the use of opioids during and after surgery [16, 17]. Opioid use, in particular, has been consistently associated with an increased incidence of PONV. Despite these numerous contributing factors, the treatment groups in the current study were well-matched in terms of demographic characteristics, surgical and anesthetic management, and postoperative analgesia. Furthermore, patients with known risk factors for PONV, such as a history of motion sickness, prior episodes of PONV, or current menstruation, were excluded to eliminate potential confounding variables. As a result, the observed differences in PONV incidence can be reliably attributed to the administered antiemetic regimens. Propofol, widely used as an induction agent, has intrinsic antiemetic properties, independent of its lipid emulsion base [18]. Although the precise mechanism remains unclear, it is believed that propofol exerts its antiemetic effect through modulation of the central nervous system, possibly involving a weak antagonistic effect on serotonin (5-HT) receptors. Experimental evidence suggests that propofol may inhibit serotonin release in the chemoreceptor trigger zone, potentially by lowering serotonin levels in the area postrema and cerebrospinal fluid [19]. This provides a plausible explanation for its efficacy in reducing nausea and retching. Dexamethasone, a corticosteroid, also demonstrates antiemetic properties, although its mechanism of action is similarly not fully understood. It has been proposed that dexamethasone reduces serotonin levels in neural tissues by depleting its precursor, tryptophan. Its anti-inflammatory properties may further contribute by preventing serotonin release from the gastrointestinal tract, and it may also enhance the efficacy of other antiemetic agents through receptor sensitization [20-22]. In this study, the combination of propofol (1-2 mg/kg) and dexamethasone (8 mg) resulted in a significantly lower incidence of PONV within the first 24 hours postoperatively compared to propofol alone. These findings align with prior studies, including that of Ryu JH, who demonstrated the superior efficacy of propofol combined with dexamethasone over propofol alone in patients undergoing laparoscopic cholecystectomy. Similarly, Ryu JH reported that in parturients undergoing cesarean delivery, the combination of subhypnotic propofol and dexamethasone significantly reduced the incidence of emetic symptoms compared to propofol alone. These consistent findings support the conclusion that a combined antiemetic approach using propofol and dexamethasone offers superior prophylaxis against PONV [23].

Conclusion

This study demonstrates that the combination of propofol (1-2 mg/kg) with dexamethasone (8 mg) is more effective in reducing postoperative nausea and vomiting (PONV) compared to the use of propofol alone. The enhanced antiemetic effect observed suggests a synergistic interaction between the two agents. However, further research and clinical experience are necessary to explore the potential non-anesthetic applications of propofol and to better understand the underlying mechanisms. Future studies should also evaluate whether these properties can be consistently translated into therapeutic benefits for broader patient populations.

References

1. Watcha MF, White PF. Postoperative nausea and vomiting: its etiology, treatment, and prevention. Anesthesiology. 1992;77:162-70.
2. Kovac AL. Prevention and treatment of postoperative nausea and vomiting. Drugs. 2000;59:213-243.
3. Gan TJ, Meyer T, Apfel CC, Chung F, Davis PJ, Eubanks S, *et al*. Consensus guidelines for managing postoperative nausea and vomiting. Anesth Analg. 2003;97:62-71.
4. Conway B. Prevention and management of postoperative nausea and vomiting in adults. AORN J. 2009;90:391-413.
5. Beattie WS, Lindblad T, Buckley DN, Forrest JB. The incidence of postoperative nausea and vomiting in women undergoing laparoscopy is influenced by the day of the menstrual cycle. Can J Anaesth. 1991;38:298-302.
6. Smessaert A, Schehr CA, Artusio JF Jr. Nausea and vomiting in the immediate postoperative period. JAMA. 1959;170:2072-6.
7. Hough MB, Sweeney BP. The influence of smoking on postoperative nausea and vomiting. Anaesthesia. 1998;53:932-3.
8. Jenkins JC, Lahay D. Central mechanisms of vomiting related to catecholamine response: anesthetic implication. Can Anaesth Soc J. 1971;18:434-41.
9. Sneyd JR, Carr A, Byrom WD, Bilski AJT. A meta-analysis of nausea and vomiting following maintenance of anesthesia with propofol or inhalational agents. Eur J Anaesthesiol. 1998;15:433-45.
10. Henzi I, Walder B, Tramer MR. Dexamethasone for the prevention of postoperative nausea and vomiting: a quantitative systematic review. Anesth Analg. 2000;99:186-94.
11. Schimmer BP, Parker KL. Adrenocorticotropic hormone: adrenocortical steroid and their synthetic analogs: inhibitors of the synthesis and actions of adrenocortical hormones. In: Hardman JG, Limbird LE, Molinoff BP, Ruddon RW, Gilman AG, editors. Goodman & Gilman's The Pharmacological Basis of Therapeutics. 10th ed. New York: McGraw-Hill; 2001. p.1649-77.
12. Borgeat A. Sub-hypnotic doses of propofol do not possess antidopaminergic properties. Anesth Analg. 1997;84:196-8.
13. Borgeat A, Stirnemann HR. Anti-emetic properties of subhypnotic doses of propofol. Anesth Analg. 1997;84:196-8.
14. Dong XP, Xu TL. The actions of propofol on gamma-aminobutyric acid-A and glycine receptors in acutely dissociated spinal dorsal horn neurons of the rat. Anesth Analg. 2002;95:907-14.
15. Rowbotham DJ. Current management of postoperative nausea and vomiting. Br J Anaesth. 1992;69(Suppl 1):46S-59S.
16. Gan TJ, Meyer T, Apfel CC, Chung F, Davis PJ, Eubanks S, *et al*. Consensus guideline for managing postoperative nausea and vomiting. Anesth Analg. 2003;97:62-71.
17. Watcha MF, White PF. Postoperative nausea and vomiting: its etiology, treatment, and prevention. Anesthesiology. 1992;77:162-84.
18. Osman PL, Glosten B, Kemen M, Robert MK, Bedwells. Is the anti-emetic effect of the emulsion formulation of propofol due to the lipid emulsion? Anesth Analg. 1990;71:536-40.
19. Cechetto DF, Diab T, Gibson GJ, Gelb AW. The effects of propofol in the area postrema of rats. Anesth Analg. 2001;92:934-42.

20. Frederiksson M, Mursti T, Furst C, Steineck G, Borjeson S, Witbom M. Nausea in cancer chemotherapy is inversely related to urinary cortisol excretion. Br J Cancer. 1992;65:779-80.
21. Sager S. The current role of anti-emetic drugs in oncology: a recent revolution in patient symptom control. Cancer Treat Rev. 1991;18:95-135.
22. Habib AS, White WD, Eubanks S, Pappas TN, Gan TJ. A randomized comparison of a multimodal management strategy versus combination antiemetics for the prevention of postoperative nausea and vomiting. Anesth Analg. 2004;99:77-81.
23. Ryu JH, Chang JE, Kim HR, Hwang JW, Oh AY, Do SH. Ramosetron vs. ramosetron plus dexamethasone for the prevention of postoperative nausea and vomiting (PONV) after laparoscopic cholecystectomy: prospective, randomized, and double-blind study. Int J Surg. 2013;11(2):183-7. doi: 10.1016/j.ijsu.2012.12.018. Epub 2013 Jan 11. PMID: 23313969.

How to Cite This Article
Mohsin WMS, Hussein HM, Abdulkareem GAA. Comparison between propofol alone and combination of propofol and dexamethasone in reduction postoperative nausea and vomiting in appendectomy surgery. International Journal of Surgery Science. 2025;9(2):28-31.