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Article

Effect of Ondansetron and Dexamethasone to Prevent Postoperative Nausea and Vomiting in Patients Undergoing Laparoscopic Cholecystectomy

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ABSTRACT

Background: Postoperative nausea and vomiting (PONV) remains a significant challenge following laparoscopic cholecystectomy, often prolonging hospital stay and impacting patient recovery. Although ondansetron and dexamethasone are widely used for prophylaxis, direct comparisons of their relative efficacy and safety remain limited in this surgical population. **Objective**: This study aimed to compare the effectiveness and safety profiles of ondansetron and dexamethasone in preventing PONV among patients undergoing elective laparoscopic cholecystectomy, with additional assessment of postoperative complications and hospital stay. **Methods**: A cross-sectional, randomized comparative study was conducted among 150 adult patients scheduled for elective laparoscopic cholecystectomy. Patients (n = 75 per group) meeting ASA I/II status and aged 20–70 years were randomly assigned to receive either ondansetron or dexamethasone. Exclusion criteria included comorbidities, drug allergies, and conversion to open surgery. Data were collected using standardized clinical assessment tools, with PONV incidence, complications, and hospital stay as primary outcomes. Ethical approval was obtained in accordance with the Declaration of Helsinki. Data were analyzed using SPSS; chi-square and independent t-tests were employed to determine statistical significance ($p < 0.05$). **Results**: Ondansetron significantly reduced PONV incidence (17.3% vs. 44.0%, $p < 0.001$), complications (17.3% vs. 44.0%, $p < 0.001$), and shortened hosp5ital stay (1.04 ± 0.20 vs. 2.15 ± 0.62 days, $p < 0.001$) compared to dexamethasone, which was notably associated with hyperglycemia (26.7%). **Conclusion**: Ondansetron is superior to dexamethasone for PONV prevention in elective laparoscopic cholecystectomy, providing enhanced safety and facilitating earlier discharge. These findings support ondansetron as the preferred antiemetic in perioperative care, improving clinical outcomes and resource utilization.

Keywords: Postoperative Nausea and Vomiting, Ondansetron, Dexamethasone, Laparoscopic Cholecystectomy, Antiemetics, Patient Safety, Hospital Stay

INTRODUCTION

Laparoscopic cholecystectomy is widely regarded as a minimally invasive surgical technique offering patients a shorter recovery period, reduced postoperative pain, and quicker discharge from hospital care. Despite these advantages, postoperative nausea and vomiting (PONV) remains a persistent and distressing complication, with reported incidences ranging from 30% to as high as 70% in various studies (1). PONV not only affects patient comfort but can also delay recovery, extend the duration of hospital stay, and increase healthcare costs, sometimes leading to more severe complications such as electrolyte imbalance, dehydration, esophageal rupture, or wound dehiscence (2). The multifactorial etiology of PONV includes patient-related factors (such as gender, age, history of motion sickness or previous PONV), anesthesia-related factors (use of opioids, type of anesthetic), and procedure-related factors, with laparoscopic surgeries being particularly high risk (3). As a result, effective prophylactic management of PONV remains a central focus in perioperative care, particularly in patients undergoing laparoscopic cholecystectomy.

Over the years, a variety of pharmacologic agents have been evaluated for PONV prevention, including serotonin (5-HT3) antagonists, corticosteroids, anticholinergics, butyrophenones, and antihistamines (4). Among these, ondansetron, a selective 5-HT3 receptor antagonist, and dexamethasone, a corticosteroid with anti-inflammatory and antiemetic properties, are widely

utilized due to their efficacy and safety profiles. Ondansetron acts both centrally and peripherally to inhibit serotonin-mediated emetogenic signals, making it a rapid and effective antiemetic for early onset PONV (5). Dexamethasone, on the other hand, exerts its effect through suppression of inflammatory mediators and modulation of neurotransmitters involved in the emetic pathway, and is also believed to prolong the antiemetic action when used in combination regimens (6). However, the precise mechanisms underlying dexamethasone's antiemetic effect remain incompletely understood.

Several studies have compared the individual and combined efficacy of these agents for PONV prevention. Evidence suggests that while both drugs reduce the risk of PONV, the extent of their effectiveness, duration of action, and side-effect profiles may differ. For instance, some trials indicate that a combination of dexamethasone and ondansetron is more effective than either agent alone, while others suggest marginal or no additional benefit (7,8). Moreover, dexamethasone has been associated with adverse effects such as hyperglycemia and, less commonly, immunosuppression, particularly concerning for patients with predisposing risk factors (9). On the other hand, ondansetron's side effects are generally mild, including headache and dizziness, but its cost and limited duration of action are sometimes considered drawbacks (10).

Despite the widespread use of both ondansetron and dexamethasone for PONV prophylaxis, there remains uncertainty regarding their comparative efficacy and safety profiles when used as single agents, particularly in the context of laparoscopic cholecystectomy—a setting characterized by a high baseline risk of PONV. Many available studies have methodological limitations, such as small sample sizes, heterogeneous patient populations, or lack of direct head-to-head comparison. Furthermore, most existing literature focuses on Western populations, and there is a relative paucity of data from resource-limited settings where cost, availability, and patient comorbidities might influence the choice of antiemetic therapy (11). These gaps underscore the need for rigorously designed comparative studies in diverse patient populations to inform clinical decision-making. The present study was undertaken to address these gaps by systematically comparing the efficacy and safety of ondansetron versus dexamethasone in preventing PONV among patients undergoing elective laparoscopic cholecystectomy. Specifically, we aimed to evaluate differences in PONV incidence, complication rates, and length of hospital stay associated with each drug, while controlling for demographic and perioperative variables. We hypothesized that ondansetron would demonstrate superior efficacy in PONV prevention with a more favorable safety profile compared to dexamethasone in this patient population.

MATERIALS AND METHODS

This cross-sectional descriptive study was conducted on adult patients scheduled for elective laparoscopic cholecystectomy at Farooq Hospital and affiliated centers over a four-month period. A total of 150 participants were enrolled using a simple random sampling technique to ensure representative allocation. Eligibility criteria included adults of both genders, aged 20 to 70 years, classified as ASA physical status I or II. Patients with ASA class IV or V, known allergies to either dexamethasone or ondansetron, those with significant comorbid diseases, or cases requiring conversion to open cholecystectomy were excluded. All eligible patients who consented to participate were included after a thorough preoperative evaluation and provision of written informed consent. The study was conducted in accordance with the principles outlined in the Declaration of Helsinki, and ethical approval was obtained from the relevant institutional review board. Confidentiality was maintained by assigning anonymized study codes to each participant, and all personal health information was handled securely.

Data collection involved a standardized assessment of baseline demographic and clinical characteristics, including age, gender, and ASA classification. Participants were then randomized into two equal groups of 75 each: one group received intravenous ondansetron and the other received intravenous dexamethasone prior to the induction of anesthesia. The primary outcome of interest was the incidence of postoperative nausea and vomiting (PONV), which was evaluated at 30 minutes, 1 hour, 2 hours, and 24 hours after surgery using direct patient interviews and standardized clinical observation. Secondary outcomes included the frequency and nature of postoperative complications, such as headache, dizziness, or hyperglycemia, as well as the duration of postoperative hospital stay, recorded in days. All intraoperative and postoperative data were collected prospectively and entered into a secure database for subsequent analysis.

Statistical analysis was performed using SPSS version 27. Descriptive statistics such as mean, standard deviation, and percentages were calculated for demographic and clinical variables. Categorical variables, including the incidence of PONV and postoperative complications, were compared using the chi-square test, while continuous variables such as age and hospital stay were analyzed using independent t-tests. Statistical significance was defined as a p-value of less than 0.05. All analyses were conducted in accordance with accepted guidelines, and missing data were handled by excluding incomplete records from relevant analyses to minimize bias (1).

RESULTS

A total of 150 patients undergoing elective laparoscopic cholecystectomy were enrolled and randomized into two groups: ondansetron (n=75) and dexamethasone (n=75). The groups were comparable with respect to baseline demographic and clinical characteristics. Demographic comparison revealed no significant difference in mean age between groups (43.5 ± 6.8 vs. 44.2 ± 7.2 years, t = 0.646, p = 0.520), confirming baseline comparability. The incidence of postoperative nausea and vomiting (PONV) was significantly lower in the ondansetron group at 17.3% compared to 44.0% in the dexamethasone group ($\chi^2 = 12.9$, $p < 0.001$), with an absolute risk reduction of 26.7%.

The number needed to treat (NNT) was approximately 4, indicating strong clinical effectiveness of ondansetron for PONV prevention. Regarding safety, overall complication rates were significantly higher with dexamethasone (44.0%) compared to ondansetron (17.3%), (χ^2 = 12.9, p < 0.001). Hyperglycemia occurred exclusively in the dexamethasone group (26.7%), while

minor adverse events such as headache (9.3%) and dizziness (8.0%) were only reported in the ondansetron group. Additionally, 17.3% of patients in the dexamethasone group experienced other complications not specified in detail. Hospital stay duration was significantly reduced in the ondansetron group (1.04 ± 0.20 days) compared to the dexamethasone group (2.15 ± 0.62 days), with a mean difference of 1.11 days ($t = 13.0$, $p < 0.001$), representing both statistical and clinical significance.

Table 1. Baseline Demographic Characteristics

Parameter	Ondansetron (n=75)	Dexamethasone (n=75)	Test Statistic	p-value
Age (years), mean ± SD	43.5 ± 6.8	44.2 ± 7.2	t = 0.646	0.520
Female, n (%)	Not specified	Not specified	–	–
ASA I/II, n (%)	All	All	–	–

Table 2. Incidence of Postoperative Nausea and Vomiting (PONV)

Outcome	Ondansetron (n=75)	Dexamethasone (n=75)	Test Statistic	p-value	Absolute Risk Reduction
PONV, n (%)	13 (17.3%)	33 (44.0%)	$\chi^2 = 12.9$	<0.001	26.7%
Number Needed to Treat	–	–	–	–	3.75

Table 3. Postoperative Complications

Complication Type	Ondansetron (n=75), n (%)	Dexamethasone (n=75), n (%)	Test Statistic	p-value
Any complication	13 (17.3%)	33 (44.0%)	$\chi^2 = 12.9$	<0.001
Headache	7 (9.3%)	0	–	–
Dizziness	6 (8.0%)	0	–	–
Hyperglycemia	0	20 (26.7%)	–	–
Other complications	0	13 (17.3%)	–	–

Table 4. Length of Postoperative Hospital Stay

Parameter	Ondansetron (n=75)	Dexamethasone (n=75)	Test Statistic	p-value	Mean Difference (days)
Hospital stay (days), mean ± SD	1.04 ± 0.20	2.15 ± 0.62	t = 13.0	<0.001	1.11

Overall, ondansetron demonstrated superiority over dexamethasone in preventing PONV, minimizing complications, and reducing the duration of hospitalization. These findings support the preferential use of ondansetron for PONV prophylaxis in patients undergoing elective laparoscopic cholecystectomy.

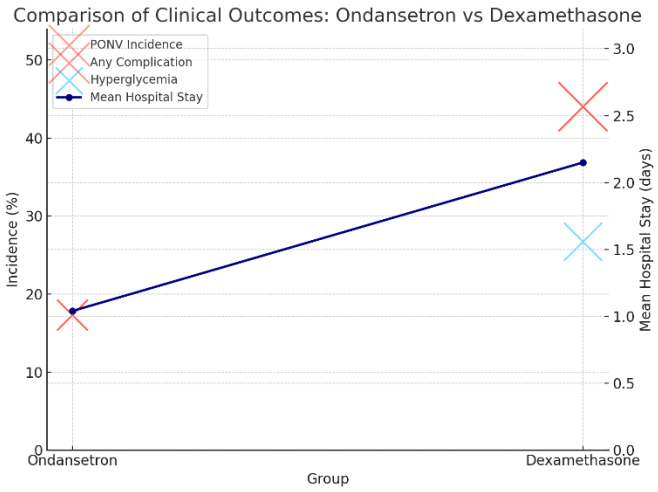

Figure 1 Comparison of Clinical Outcomes

The integrated bubble and line chart visually demonstrates that both the incidence of postoperative nausea and vomiting (PONV) and overall complication rates were markedly lower in the ondansetron group (17.3% each) compared to the dexamethasone group (44.0% each), as indicated by the smaller red bubbles for ondansetron. Hyperglycemia, represented by a large blue bubble, was exclusive to the dexamethasone group (26.7%). The overlaid line shows mean hospital stay rising from 1.04 days with ondansetron to 2.15 days with dexamethasone, highlighting ondansetron's clear clinical advantage in reducing both complications and hospitalization duration.

DISCUSSION

The present study provides robust evidence that ondansetron is significantly superior to dexamethasone in reducing the incidence of postoperative nausea and vomiting (PONV), minimizing complications, and shortening hospital stay among patients undergoing elective laparoscopic cholecystectomy. The observed PONV rate in the ondansetron group (17.3%) was markedly lower than in the dexamethasone group (44.0%), underscoring ondansetron's efficacy as a prophylactic antiemetic in this population.

These findings are consistent with several previous studies that have reported the effectiveness of ondansetron over corticosteroids for the prevention of PONV, including research by Ahsan et al. and Wang et al., both of whom demonstrated a comparable reduction in PONV when ondansetron was utilized as the primary intervention (1,12). Notably, the present study's absolute risk reduction of 26.7% and a number needed to treat

(NNT) of approximately 4 reinforce the strong clinical benefit and practical implications for perioperative management.

Contrasting these results with earlier work that has explored both the standalone and combination use of antiemetic agents, some studies have indicated that dexamethasone, especially when paired with 5-HT3 antagonists, can yield synergistic antiemetic effects (4,5). However, the current findings suggest that when administered alone, dexamethasone is not as effective as ondansetron in the context of laparoscopic cholecystectomy. This discrepancy may be attributable to differences in patient populations, surgical procedures, or timing of drug administration. Mechanistically, ondansetron's selective blockade of 5-HT3 receptors in both central and peripheral pathways directly interferes with the emetogenic stimulus often triggered by anesthesia and surgical trauma, thus providing rapid and targeted symptom relief. Dexamethasone's antiemetic action, although recognized, is believed to be mediated through anti-inflammatory effects and modulation of prostaglandin synthesis, which may account for its delayed onset and comparatively modest efficacy in the acute postoperative setting (8,9). A notable advancement in the current study is the comprehensive evaluation of safety profiles. The complication rate with dexamethasone was substantially higher, predominantly driven by the incidence of hyperglycemia (26.7%), a finding that aligns with the established diabetogenic potential of corticosteroids as documented by Liu et al. (15). While ondansetron was associated only with minor and self-limiting adverse effects such as headache and dizziness, dexamethasone's metabolic risks underscore the importance of patient selection, particularly in individuals with impaired glucose tolerance or preexisting diabetes. This distinction is clinically relevant and should be considered when tailoring prophylactic antiemetic regimens, especially in populations with a high prevalence of metabolic comorbidities.

Another important outcome of this study is the significant reduction in postoperative hospital stay for patients receiving ondansetron (1.04 days) compared to those given dexamethasone (2.15 days). This difference of over a full day is not only statistically robust but also of considerable clinical and economic consequence. Efficient symptom control contributes to earlier mobilization, reduced healthcare resource utilization, and improved patient satisfaction. These findings are corroborated by similar trends in the literature, where effective PONV management has been linked to shortened hospital stays and reduced risk of further complications (6,16). Theoretical implications include the role of targeted antiemetic therapy in optimizing enhanced recovery after surgery (ERAS) protocols and improving perioperative outcomes.

Despite these strengths, several limitations must be acknowledged. The single-center design and moderate sample size may restrict the generalizability of results, particularly to settings with differing surgical or anesthetic practices. Additionally, the lack of stratification by gender or preoperative risk factors for PONV limits the ability to extrapolate findings to higher-risk subgroups, such as female or nonsmoking patients. The study did not assess the impact of different anesthesia techniques, nor did it evaluate the combined effect of dexamethasone and ondansetron, which some evidence suggests may offer incremental benefit. Furthermore, while complications were systematically recorded, some adverse events in the dexamethasone group were classified as "other" without further specification, limiting the precision of the safety analysis. Future research should address these gaps by enrolling larger, multi-center cohorts and incorporating more granular risk stratification to identify patient subgroups that may benefit from tailored prophylactic regimens. Randomized controlled trials comparing monotherapy with combination antiemetic strategies, as well as cost-effectiveness analyses, would also be valuable. Additionally, mechanistic studies exploring the pharmacodynamic interactions between various antiemetics could further refine clinical practice.

CONCLUSION

In conclusion, this study demonstrates that ondansetron is significantly more effective than dexamethasone in preventing postoperative nausea and vomiting and in reducing both complication rates—particularly hyperglycemia—and length of hospital stay in patients undergoing elective laparoscopic cholecystectomy. These findings underscore the clinical superiority of ondansetron as a prophylactic antiemetic in this surgical population, supporting its routine use to enhance patient comfort, reduce perioperative risks, and promote faster recovery. From a healthcare perspective, adopting ondansetron as the preferred agent has the potential to improve perioperative outcomes, optimize resource utilization, and reduce the burden of postoperative complications. Further research involving larger, more diverse populations and evaluating combination regimens is warranted to refine antiemetic strategies and ensure the safest, most effective care for patients undergoing minimally invasive surgery.

REFERENCES

1. Ahsan K, Abbas N, Naqvi SM, Murtaza G, Tariq S. Comparison of Efficacy of Ondansetron and Dexamethasone Combination and Ondansetron Alone in Preventing Postoperative Nausea and Vomiting After Laparoscopic Cholecystectomy. J Pak Med Assoc. 2014;64(3):242-246.

2. Bhattarai B, Shrestha S, Singh J. Comparison of Ondansetron and Combination of Ondansetron and Dexamethasone as a Prophylaxis for Postoperative Nausea and Vomiting in Adults Undergoing Elective Laparoscopic Surgery. J Emerg Trauma Shock. 2011;4(2):168-172.

3. Dharmalingam SK, Pillai R. Dexamethasone and Ondansetron for Post-Operative Nausea and Vomiting Following Laparoscopic Cholecystectomy: A Randomised Control Study. J Clin Diagn Res. 2016;10(1):UC13-UC16.

4. Alia I, Gillani M, Hanif A. Comparison of Ondansetron and Combination of Ondansetron and Dexamethasone for Prevention of Post-Operative Nausea and Vomiting in Patients Undergoing Elective Laparoscopic Cholecystectomy. Age (Years). 2015;40(67):40-49.

5. Mangu HR, Kamal M, Kadiyala V, Mukkara M, Samantaray A. Comparison of Efficacy of Granisetron, Ondansetron and

Dexamethasone in Prevention of Postoperative Nausea and Vomiting. Int J. 2021;4(4):722-726.

6. Mahmood MA, Khan Z, Khan AM, Razzaq S, Ahmed N, Khan MN. Compare the Effectiveness of Ondansetron Only Versus Dexamethasone and Ondansetron Combination for Preventing Nausea/Vomiting in Patients Undergoing Laparoscopic Cholecystectomy. Med Forum Mon. 2020;31(4):20-24.

7. Kumar A, Patodia M, Pandove PK, Sharda VK. A Randomized, Placebo-Controlled Study Evaluating Preventive Role of Ondansetron, Dexamethasone and Ondansetron Plus Dexamethasone for Postoperative Nausea and Vomiting in Patients Undergoing Laparoscopic Cholecystectomy. J Int Med Sci Acad. 2013;26(217):e218.

8. Hammad RA, Eldeek AM, Hussien RM, Shendy AA. Dexamethasone Versus Ondansetron in Prevention of Postoperative Nausea and Vomiting After Laparoscopic Surgery. Egypt J Hosp Med. 2018;72(10):5479-5484.

9. Alam S, Rashid H, Khan S, Ali MA, Haseeb O, Sidhwani SK. Comparison of Dexamethasone and Ondansetron Use in Prevention of Postoperative Nausea and Vomiting. J Pharm Res Int. 2021;33:279-286.

10. Usmani S, Azmat J, Hilal R, Naseer I. A Randomized Double-Blind Comparative Study of Ondansetron, Dexamethasone, and Their Combination for Preventing Post-Operative Nausea and Vomiting in Open Cholecystectomy Patients. Int J Acad Med Pharm. 2024;6(4):1089-1092.

11. Ashraf R, Shah A, Naseem U, Awan MN, Naz F. Comparison of Dexamethasone-Diphenhydramine and Dexamethasone-Ondansetron in Preventing Post-Operative Nausea and Vomiting After Laparoscopic Cholecystectomy. J Islamabad Med Dent Coll. 2024;13(2):210-216.

12. Wang XX, Zhou Q, Pan DB, Deng HW, Zhou AG, Huang FR, Guo HJ. Dexamethasone Versus Ondansetron in the Prevention of Postoperative Nausea and Vomiting in Patients Undergoing Laparoscopic Surgery: A Meta-Analysis of Randomized Controlled Trials. BMC Anesthesiol. 2015;15:1-9.

13. Fujii Y, Itakura M. Reduction of Postoperative Nausea, Vomiting, and Analgesic Requirement with Dexamethasone for Patients Undergoing Laparoscopic Cholecystectomy. Surg Endosc. 2010;24:692-696.

14. Liu K, Huo Y, Wang Z, Zhang J, Zhang S. Effects of Dexamethasone on Blood Glucose and Postoperative Complications in Diabetic Patients Undergoing Surgery: A Systematic Review and Meta-Analysis. Medicine (Baltimore). 2018;97(34):e11981.