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Efficacy Of Ondansetron Alone Versus Ondansetron Combined With Dexamethasone In Preventing Postoperative Nausea And Vomiting Under General Anesthesia

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ABSTRACT

Introduction: Post-operative nausea and vomiting (PONV) is a common and distressing complication in the post-operative period. It increases patient discomfort, prolongs post-anaesthesia care unit (PACU) stay, raises the risk of postoperative complications and readmission, and adds to healthcare costs. Ondansetron and dexamethasone are widely used for PONV prophylaxis.

Methods: This prospective study included 60 patients aged 20–65 years, weighing 55–70 kg, with ASA physical status I or II, scheduled for elective abdominal surgery under general anesthesia. Patients were randomly divided into two groups (n=30 each). Group I received ondansetron 4 mg IV, while Group II received ondansetron 4 mg IV plus dexamethasone 4 mg IV. Study drugs were administered intravenously 15 minutes before induction of anesthesia.

Results: In Group II, no patient experienced PONV during the first two postoperative hours, and only one patient reported nausea and vomiting by the end of postoperative day 0. In contrast, Group I had four patients with PONV within the first two hours and ten patients by the end of postoperative day 0.

Conclusion: The combination of dexamethasone with ondansetron was more effective in preventing PONV compared to ondansetron alone.

Keywords: PONV, Ondansetron, Dexamethasone

INTRODUCTION

Post operative nausea and vomiting (PONV) are common distressing symptoms in patients undergoing laparoscopic surgery in general anesthesia and can contribute to anxiety dehydration, wound disruption, metabolic abnormality, delayed recovery and it is an economic and social burden **(D' Souza et al., 2011)**. The treatment of nausea and vomiting should be aimed at specific receptors/mediators that appear to be largely contributing to an individual patient experience. A greater appreciation of which particular mechanisms are playing a major role for an individual patient may lead to target therapies in attempts to eliminate nausea and vomiting, minimize treatment induced adverse effects and optimize patient outcomes. Post operative nausea and vomiting is the most frequently side effect after anesthesia **(Eberhart LH et al, 2000).**

It affects around 30% of general patients and up to 70% of those considered high risk within the first 24 hours after waking up **(Gan TJ 2002**). PONV occurs less frequently in outpatient surgeries than inpatient ones, but it may be under reported in outpatient settings because patients are often discharged before symptoms appear **(Carroll NV et al,.1995).** Although usually mild and non- fatal, PONV can lead to serious complications such as dehydration, electrolyte imbalances, tension on surgical sutures, wound opening, increased blood pressure in veins, bleeding, esophageal tears, and in rare cases life-threatening airway obstruction. Each vomiting episode can also delay the discharge of the patient from the recovery room by about 20 minutes.

Postoperative nausea and vomiting (PONV) a complex response involves several neurotransmitter systems and pathways in the body, particularly in the central nervous system (CNS) and gastrointestinal tract. The main mechanisms behind PONV include the activation of specific receptors and pathways that trigger the vomiting center in the brainstem. Overall, PONV results from a combination of stimuli affecting the CNS and GI tract, leading to the activation of the vomiting center and the complex reflex of nausea and vomiting.

Ondansetron is a selective serotonin (5hydroxytryptamin,5-HT3) receptor antagonist that exhibits an anti-emetic action by antagonizing vomiting signals in the afferent pathway from the stomach, small intestine and solitary tract nucleus, and is effective at preventing PONV, however the high cost of this drug has prevented it from being widely used. **(Hirayama et al. 2001)**

Dexamethasone was first reported as an effective anti-emetic agent in patients undergoing cancer chemotherapy in 1981. Dexamethasone is most effective when it is administered at the induction rather than at the termination of anesthesia **(Wang et al.2009)**. However, the mechanism underlying the anti-emetic effects of dexamethasone is still unknown. It may be involved in central inhibition of prostaglandin synthesis, or it may cause a decrease in serotonin turnover in the central nervous system. Today, cost benefit analyses have become an important factor when considering what drugs to use as prophylactic antiemetics. However, it has not been established whether dexamethasone is a cost-effective alternative to ondansetron in the

prevention of PONV in patients undergoing laparoscopic surgeries.

Postoperative nausea and vomiting (PONV) in patients undergoing laparoscopic cholecystectomy (LC) has been both prevented and managed using various classes of antiemetic drugs. Numerous pharmacological strategies have been explored to reduce the incidence and severity of PONV in this surgical population. Among the available antiemetic regimens, the combination of serotonin (5-HT3) receptor antagonists with dexamethasone has been widely recognized as one of the most effective approaches. This combination works through complementary mechanisms, enhancing antiemetic efficacy and providing superior prophylaxis against PONV following laparoscopic cholecystectomy when compared to single-agent therapy **(Shaikh SI et al. 2016).**

AIM OF THE STUDY

To study the comparison between ondansetron and combination of ondansetron with dexamethasone for the prevention of post operative nausea and vomiting after abdominal surgeries.

OBJECTIVES OF THE STUDY

- To compare the efficacy of Ondansetron and combination of ondansetron with dexamethasone in the prevention of post operative nausea and vomiting in all the patients.
- To evaluate any incidence of further episode of nausea and vomiting in the post operative in all the patients.

REVIEW OF LITERATURE

Post-operative nausea and vomiting (PONV) is a frequent and uncomfortable complication after anesthesia, especially following abdominal surgeries. It can significantly affect patient comfort, delay recovery, and increase hospital stay and treatment costs. Ondansetron, a commonly used 5-HT_3 receptor antagonist, is effective in preventing PONV but may not be sufficient when used alone in patients at higher risk. As a result, combining antiemetic drugs that act through different mechanisms has gained attention. Dexamethasone, with its proven antiemetic properties, is often used as an adjunct to enhance the effect of ondansetron. The combined use of ondansetron and dexamethasone may offer better protection against PONV than ondansetron alone. This study aims to compare the effectiveness of ondansetron alone with its combination with dexamethasone in preventing PONV after abdominal surgeries.

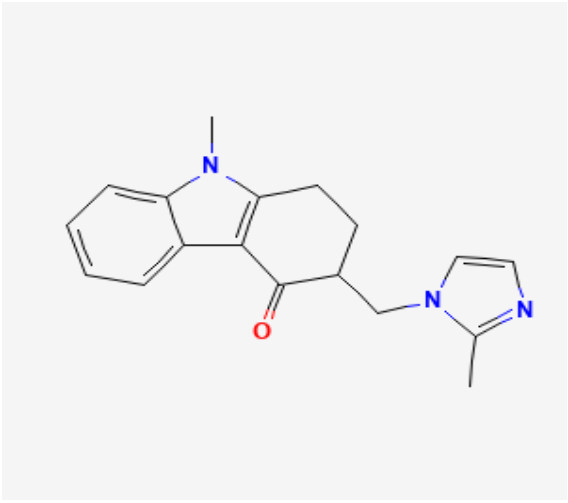
Rajeeva V et al., (1999) conducted a study on 51 female patients, aged 20-40 years, with ASA-1 physical status, undergoing gynecological diagnostic laparoscopy. Group 1 (n = 26) received 4 mg ondansetron intravenously (i.v.), while group 2 (n = 25) received a combination of 4 mg ondansetron and 8 mg dexamethasone i.v. after the induction of anesthesia. Postoperative assessments for nausea, vomiting, pain, and post-anesthetic discharge score were made hourly for the first four hours and then at 24 hours. Vomiting within 2 hours was categorized as early vomiting, and vomiting between 2 and 24 hours as delayed vomiting. They found that the postoperative nausea score was significantly lower in the combination group (3.76) compared to the ondansetron-only group (4.38) at 0 hours ($P < 0.01$), 2 hours ($P < 0.05$), and 24 hours ($P < 0.01$). In group 1, 38.5% had a nausea score ≥ 5, compared to only 12% in group 2 ($P < 0.025$). The overall incidence of vomiting was higher in group 1 (35%) compared to group 2 (8%) ($P < 0.05$). The combination therapy also demonstrated better control of delayed vomiting (4% vs 35%) ($P < 0.01$).

Feo C Vet al., (2006) conducted study on double-blind, placebo-controlled trial conducted between March and December 2004 enrolled 101 patients undergoing laparoscopic cholecystectomy. Participants were randomly assigned to receive either 8 mg dexamethasone (n = 49) or placebo (n = 52) intravenously before surgery. Six patients were excluded from the study. All participants received a standardized anaesthetic, surgical, and multimodal analgesic treatment. The primary endpoints were postoperative nausea, vomiting, pain, and the requirements for analgesics and antiemetics. Pain was assessed using visual analogue and verbal response scales, while nausea and vomiting were evaluated at 1, 3, 6, and 24 hours postoperatively.

Results showed that only 14% of patients in the dexamethasone group reported nausea and vomiting, compared to 46% in the placebo group ($P = 0.001$). Additionally, 10% of patients in the dexamethasone group required antiemetics, while 44% in the placebo group did ($P < 0.001$). No significant differences were observed in postoperative pain scores or analgesic requirements between the two groups. No side effects were noted in either group. The study concluded that dexamethasone significantly reduced the incidence of nausea and vomiting after laparoscopic cholecystectomy without affecting postoperative pain control or analgesic needs

ONDANSETRON

- **Class**: Antiemetic, 5-HT3 receptor antagonist
- **Structure**: A synthetic compound with a chemical formula of $C_{18}H_{19}N_3O$, containing a benzene ring, a tetrahydronaphthalene ring, and a hydroxyl group



Chemical structure of Ondansetron

Ampoule of Ondansetron

DEXAMETHASONE

- **Class**: Corticosteroid, glucocorticoid
- **Structure**:

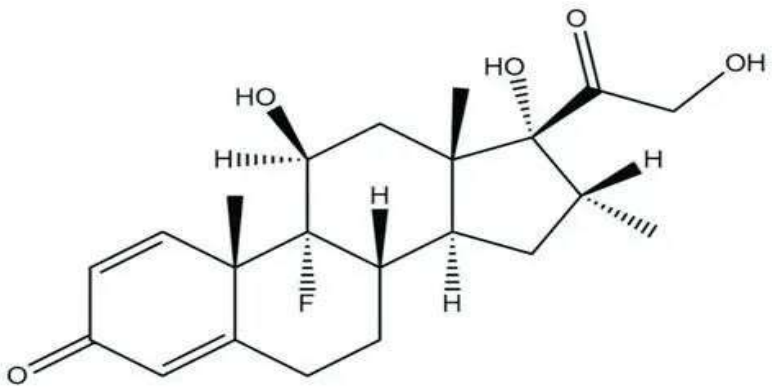


Image 3. Chemical structure of dexamethasone

Vial of Dexamethasone

MATERIALS AND METHODS

Materials

The present study was conducted in the department of anesthesiology at the Max superspeciality hospital Mohali Punjab, after taking approval from the institutional committee.

Sixty (60) surgical patients of age 20-65 years, of weight 55-70kg, with ASA grade of I and II, of either gender was scheduled for elective abdominal surgeries under general anesthesia. They were divided into 2 groups of 30 each, group I and group II.

The study drugs were given intravenously 15mins before induction of anesthesia.

Group I (n=30) patients received injection ondansetron 4mg iv

Group II(n=30) patients received injection ondansetron 4mg iv and dexamethasone 4mg iv

Written explained informed consent of all patients was be taken.

Exclusion criteria

- Obesity (BMI>30 kg/m2)
- Patients with history of nausea, vomiting or use of antiemetics within 24 hours prior to surgery
- Patients with history of motion sickness
- Patients with ASA grade III or more
- Patients with history of allergy to any protocol medication
- Patients with episode of any intra operative complications, if any
- Patients with history of egg allergy
- Patients with neuromuscular disorders

- Anticipated difficult airway
- Pregnancy

Methods

PRE- ANESTHETIC CHECK UP

Details about the patient's clinical history, general, physical and systemic examinations, and basic routine investigations like Hb, blood sugar, blood urea, creatinine, bleeding time, clotting time, ECC and chest x-rays was checked. Tab. alprazolam 0.25mg HS at bed time was given 1 day before surgery. Tab. Ranitidine 150 mg, one tab, were given orally with a sip of water 2 hours prior to surgery. The patient was kept nil per oral (NPO) 8 hours prior to surgery.

ANESTHETIC TECHNIQUE

In operative room, routine monitoring (e.g.: non- invasive blood pressure, pulse oximetry, ECG) was used. Appropriate intravenous line was obtained and intravenous fluids were started.

All the patients were premedicated with inj. Glycopyrrolate 0.2mg iv, and inj. fentanyl 2mcg/kg iv. Patients were pre oxygenated with 100% oxygen for 3-5 mins.

Each patient was instituted with the group specific study drug 15 mins prior to induction of anesthesia over 10 secs.

Anesthesia was induced with inj. Propofol 2mg/kg iv until the loss of response to verbal command. Patients were then subjected to bag mask ventilation with 100% oxygen. After a positive bag and mask ventilation, neuro muscular blocking agents. inj. succinylcholine 1.5mg/kg iv was instituted. As the fasciculations reached the foot end of the patient, airway was maintained with the endotracheal tube (appropriate according to the weight, age and gender of the patient) and the cuff was inflated with the amount of air according to the size of endotracheal tube. Breathing circuit was connected and checks were done for smooth ventilation and bilateral equal air entry.

Anesthesia was maintained by N2O:O2::50:50, volatile agent Isoflurane 0.5- 1.5% and inj. Atracurium 0.1mg/kg iv incremental doses. At the end of the survey neuro muscular blockade was reversed with inj. Neostigmine 0.05mg/kg iv and inj. Glycopyrrolate 0.2mgiv after the return of spontaneous respiration.

Airway device was removed once the patient has adequate spontaneous respiration, cough reflex, spontaneous eye opening and head lift.

In the post operative room, all the patients were nursed in the propped position and routine monitors was applied. Patients were given supplemental O2 via face mask.

The following parameters was recorded:

1- Demographic Variables

- Age (Yrs)
- Weight (Kgs)
- Height (cm)
- Gender (M/F)
- ASA grade I and II
- Type of surgery
- Duration of surgery

2- Study variables

- In the post operative period, any further incidence of nausea and vomiting was checked out
- Once the patient reaches the post operative area, the time was noted as t0
- Then at 1 hour interval for first 2 hours.
- Therefore every 6^{th} .6^{th} and 12^{th} hour interval as per the shift of nursing staff.

The incidence of the episodes of PONV was checked for 24 hours after the completion of the surgery.

RESULTS

Sixty (60) surgical patients of age 20-65 years, of weight 55-70 kg, with ASA grade of I and II, of either gender were scheduled for elective abdominal surgeries under general anesthesia. They were divided I into 2 groups of each 30 each - Group I (n=30) received injection Ondansetron 4mg iv and Group II (n=30) received injection Ondansetron 4mg iv and Dexamethasone 4mg iv. The study drugs were given intravenously 15 min before induction of anesthesia.

Table 1: Shows the Comparison of Demographic Variables in both the groups

Variable	Group I	Group II	p-value
Age (years)	55.26±13.62	57.34±12.57	0.22
Height (cm)	162.10 ± 6.63	161.93 ± 5.59	0.91
Weight (kg)	62.54±12.44	61.68±11.42	0.36
Gender	M=14 (46.66%)	M=18 (60%)	0.48
	F=16 (53.33%)	F=12 (40%)	0.75
ASA Physical Status			
• Grade I	I=12 (40%)	I=15 (50%)	0.58
• Grade II	II=18 (60%)	II=15 (50%)	0.57

The data was mean ± SD for both the groups.

In Group I, the mean age of the patients was 55.26±13.62 years and in Group II, the mean age was 57.34±12.57 years. When compared statistically, p value was >0.05 (0.22) which was statistically not significant.

In Group I, the mean weight of the patients was 62.54±12.44 kg and in Group II, the mean age was 61.68±11.42 kg. When compared statistically, p value was >0.05 (0.36) which was statistically not significant.

In terms of gender distribution, in group I, there were 46.66% males (n=14) and 53.33% females (n=16). In group II, there were 60% males (n=18) and 40% females (n=12). When compared statistically, p value was

>0.05 (0.48 for males and 0.75 for females)) which was statistically not significant.

For ASA grade classification, in group I, 40% of the patients belonged to grade I (n=12) and 60% belonged to grade II (n=18). Similarly, in group B, 50% patients belonged to grade I (n=15) and 50% of the patients belonged to grade II (n=15). When compared statistically, p value was >0.05 (0.58 for grade I and 0.57 for grade II) which was statistically not significant.

Table 2: Shows the comparison of PONV during first two hours in PACU in both the groups

Time-interval	Group I	Group II	P-value
T0	0	0	-
T1	0	0	-
T2	4 (13.33%)	0	-

The data was mean ± SD for both the groups.

During the first two hours in the post-operative area, in group I, none of the patients complained of nausea and vomiting at the time of their arrival in PACU and within first one hour. There were 4 patients who complained of nausea and vomiting at the end of two hours. However, none of the patients in group II complained of nausea and vomiting within first two hours in PACU.

DISCUSSION

60 Surgical patients of age 20-65 years, of weight 55-70 kg, with ASA grade of I and II, of either gender were scheduled for laparoscopic surgeries. They were divided into 2 groups of each 30 each - Group A (n=30) received injection Ondansetron 4mg iv and Group B (n=30) received injection Dexamethasone 4mg iv. The study drugs were given intravenously 15 min before induction of anesthesia.
Following were the findings of this study –

1. The demographic variables, such as age, height, weight, gender and ASA grade, were statistically not significant in both the groups.
2. During the first two hours in the post-operative area, in group A, none of the patients complained of nausea and vomiting at the time of their arrival in PACU and within first one hour. There were 4 patients who complained of nausea and vomiting at the end of two hours. However, none of the patients in group B complained of nausea and vomiting within first two hours in PACU.
3. In the post-operative period, in group A, there were none of the patients who complained of PONV at the end of first six hours, there were 4 patients who had nausea and vomiting at the end of evening shift of nursing staff and there were 10 patients who had nausea and vomiting by the end of POD0. However, in group B, there were no patients who had nausea and vomiting by the end of

evening shift and there was only 1 patient who had nausea by the end of POD0.

Rajeeva et al. (1999) studied 51 ASA-I women undergoing gynecological diagnostic laparoscopy and compared ondansetron alone with ondansetron plus dexamethasone for PONV prophylaxis. The combination significantly reduced postoperative nausea, vomiting, and delayed vomiting compared to ondansetron alone.

Mokhtar E et al. (2003) studied 180 patients randomized to saline, ondansetron alone, or ondansetron combined with varying dexamethasone doses for PONV prevention.

Ondansetron with dexamethasone 8 mg and 16 mg significantly reduced PONV incidence at 12–24 hours compared to placebo and ondansetron alone.

Pain scores, analgesic use, hospital stay, and side effects were comparable across all groups, indicating good tolerability.

Rodriguez SPE et al. (2010) found that prophylactic dexamethasone significantly reduced postoperative nausea, vomiting, pain, fatigue, and analgesic requirements compared to placebo in patients undergoing elective laparoscopic cholecystectomy.

Bano F et al. (2008) showed that combining ondansetron with dexamethasone significantly reduced postoperative nausea and vomiting compared to dexamethasone alone in ASA I–II patients undergoing laparoscopic cholecystectomy, without increased side effects.

Chilkoti GT et al. (2025) reported that ondansetron 100 μg combined with dexamethasone 8 mg was more effective in reducing early postoperative nausea and vomiting than ondansetron 50 μg with dexamethasone, particularly within the first 1–2 hours, with similar rescue antiemetic requirements and hemodynamic stability.

Bhattarai et al. (2011) studied 100 adults undergoing laparoscopic surgery and found ondansetron–dexamethasone significantly improved PONV prevention. Complete response occurred in 92% with combination therapy versus 76% with ondansetron alone, with significantly reduced rescue antiemetic requirement, demonstrating superior efficacy of the combined regimen.

CONCLUSION

Postoperative nausea and vomiting (PONV) is a major concern for patients during the recovery period, as it causes significant discomfort, may increase the risk of complications, prolong post-anesthesia care unit (PACU) stay, and add to the financial burden on healthcare systems. Effective prevention of PONV is therefore essential for improving patient outcomes and overall postoperative recovery. Ondansetron and dexamethasone are among the most commonly used agents for PONV prophylaxis.

The findings of this study indicate that patients who received dexamethasone experienced a notably lower incidence of PONV compared with those who received ondansetron, suggesting superior efficacy.

To further validate these results and optimize preventive strategies, large-scale, multicenter studies investigating various drugs and drug combinations are recommended, which could help establish

standardized, evidence-based guidelines for PONV management.

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