

Comparison of Ondansetron and Granisetron in Prevention of Post-Operative Nausea and Vomiting Following Laparoscopic Cholecystectomy

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ABSTRACT

Background: The unpleasant negative consequences of general anesthesia, such as nausea or vomiting (PONV), are often encountered during laparoscopic procedures. Patients having laparoscopic cholecystectomy under general anesthesia were studied to determine the relative effectiveness of the antiemetic drugs ondansetron and granisetron, both of which target the 5-hydroxytryptamine-3 receptor. **Objective:** The primary objective of this research is to compare the effectiveness of granisetron and ondansetron in preventing post-operative nausea and vomiting (PONV) in patients with laparoscopic cholecystectomy. **Study Design:** Randomized, prospective study. **Settings:** This study was conducted at Department of Anesthesiology Shaikh Zayed Hospital, Lahore Pakistan. **Duration:** February 2022 to July 2022. **Methods:** Sixty patients between the ages of 20 and 60 with ASA-PS I/II and body masses of 40 to 80 kg were enrolled in this study of laparoscopic cholecystectomy performed under general anesthesia. There was a total of sixty patients, with thirty patients assigned to Group I (Ondansetron 4mg intravenously) and 30 patients assigned to Group II (Granisetron 2mg intravenously). Both medicines were administered in a total of 10 ml of normal saline at the conclusion of the surgery, just before the neuromuscular blockade was inverted. We looked at how often patients threw up in the first 6, 12, and 24 hours after surgery. The data were evaluated using SPSS version 20. Statistical significance was achieved when the p-value was less than 0.05. **Results:** Patients treated with ondansetron had a 75% full response rate, whereas those treated with granisetron had an 86% complete response rate ($P < 0.05$). The data showed no statistical significant change in recovery time after surgery was found between the two medicines, and only a moderate difference in adverse events was seen. **Conclusion:** When used as a preventative measure before laparoscopic cholecystectomy, ondansetron was linked with a higher rate of postoperative nausea and vomiting (PONV) than granisetron.

Keywords: Laparoscopic, Cholecystectomy, Ondansetron, Granisetron, Post-operative nausea and vomiting.

INTRODUCTION

Patients often report feeling sick after surgery, a condition known as postoperative nausea and vomiting (PONV). Dehydration, electrolyte imbalance, aspiration pneumonitis, wound dehiscence, hemorrhage, and esophageal rupture are all possible consequences of PONV in addition to the aforementioned pain and increased difficulty completing activities of daily life.¹

Medical expenditures and length of stay in the postoperative recovery area (PACU) may go up if patients have PONV. PONV occurs in around 30% of individuals overall, and in high-risk patients, this number may rise to 80%.^{2,3} Historically, researchers have separated potential causes of adverse surgical outcomes (PONV) into three categories: patient, anesthetic, and surgical. Considerations specific to each individual

patient included their gender, age, migraine, motion sickness, body mass index, and overall health.⁴

These days, many surgeons choose to do surgeries using laparoscopy. Both surgical mortality and morbidity have been drastically reduced as a result of this. Laparoscopic cholecystectomy is quickly replacing open cholecystectomy as the treatment of choice for symptomatic cholelithiasis. In cases of symptomatic cholelithiasis, this technique is recommended because of its decreased risk of morbidity and death.⁵ The incidence of PONV might reach 60% in individuals having laparoscopic cholecystectomy without antiemetic therapy.⁶ Antiemetic prophylaxis is required, even though postoperative comfort might be increased with minimally invasive surgery if the high incidence of PONV in patients who do not get it is avoided. General anesthesia is characterized as a drug-induced coma that can be quickly reversed.³ Furthermore, PONV worsens the painful and frequent outcome of general anesthesia.⁷

Aspiration pneumonia, hypoxia, respiratory obstruction, postoperative nausea and vomiting (PONV), hypoventilation, hypotension, and hypertension are all potential side effects of general anesthesia. One of the most upsetting and common adverse outcome of general anesthesia is PONV.⁸

Ondansetron's antiemetic action lasts for about three hours six, thus it's often used in anesthetic and surgical treatment to avoid postoperative nausea and vomiting by giving patients several doses. Recently, it has been studied for potential use as a pre-anesthetic medication for maintaining a hemodynamic state.⁹ The serotonin 5-HT₃ receptor antagonist granisetron has a half-life almost twice as long as that of Ondansetron.¹⁰ Preventing postoperative neoplasia is difficult following laparoscopic procedures. Therefore, it is extremely desired to have a preventive regimen that effectively reduces postoperative morbidity and suffering for patients. This research aimed to evaluate the relative benefits of intravenous ondansetron and granisetron with the purpose of reducing the risk of PONV in patients who are going through LC.

METHODS

Our Hospital's ethical review board gave its consent to this research project. This study was conducted at Department of Anesthesiology Shaikh Zayed Hospital, Lahore from February 2022 to July 2022. Sixty patients were chosen for the research, all of them were adults between the ages of 18 and 50, between 45 and 70 kg in weight, and scheduled for Laparoscopic procedures. The 60 patients were split evenly between two groups of 30. Both the Ondansetron (Group 'I', n = 30) and Granisetron (Group 'II', n = 30) groups had similar numbers of

participants. A prospective, randomized trial was conducted. Patients in both groups gave their written permission after receiving the necessary information. Twelve hours before administering general anesthesia, they were given an oral dose of 0.2mg/kg -1 diazepam (to calm nerves). Before surgery, patients went without eating or drinking for 12 hours.

An intravenous line was placed in the preoperative area. Baseline measurements of systolic and diastolic pressure and pulse rate and oxygen saturation were taken using regular monitoring equipment such as pulse oximetry, noninvasive blood pressure (NIBP), and electrocardiogram (ECG) monitors in the operating room. After intubation, capnography was applied afterward.

All patients underwent the same kind of surgery and anesthetic. Intravenous thiopentone was instilled at a dose of 5 mg/kg to produce anesthesia. Scoline 2 mg/kg is used for intubation. We employed N₂O at 66%, O₂ at 33%, halothane at 0.5-2%, vecuronium bromide at intermittent dosages, and fentanyl at 1.5 g/kg/min for analgesia. End-tidal carbon dioxide was maintained at 35-40 mm of Hg by mechanically regulated ventilation. Video guidance was used in laparoscopic procedures. Patients were positioned in the trendelenberg position as needed throughout surgery, and carbon dioxide was insufflated to provide an intra-abdominal pressure of 12-15 mm Hg. Patients in Group I got 4 mg of intravenous ondansetron at the conclusion of surgery, whereas those in Group II received 2 mg of intravenous granisetron during a 30-second infusion time. Patients were extubated and placed in the supine position after a neuromuscular block was restored with intravenous (IV) glycopyrrolate 0.005mg/kg-1 and neostigmine 0.05-1 mg/kg. Every five minutes for thirty minutes, a patient's systolic and diastolic pressure and pulse rate are monitored in the post-operative care unit. Each patient was questioned directly about their experiences with nausea and vomiting. Patients who had nausea or vomiting were counted at 0, 4, 12, and 24 hours. Rescue If the patient was vomiting, an antiemetic (10 mg of Metoclopramide) was administered.

The amount of time it took for the patient to react to basic vocal directions after the nitrous oxide was turned off was recorded as the Recovery time (in minutes). And it was tracked and compared for every medicine. A clinical recovery score was used to evaluate patients and measure outcomes in this area. Simple questions were used to assess awareness, understanding, and orientation. Assessments of the clinical recovery score were made and recorded at 0, 1, 2, 3, and 4 hours following the patient's arrival in the recovery room. During the 24-hour research period, participants reported any drug-related side effects they experienced, such as headache, dizziness, hypersensitivity, or constipation.

The data in this research was analyzed using SPSS.20. Time (in minutes) between turning off the nitrous oxide and the patient responding to basic vocal orders was considered the Recovery time. And it was tracked and compared for every medicine.

RESULTS

There was a total of 60 participants. Most participants in both cohorts were between the ages of 18 and 30. There was no discernible difference between the two groups statistically. ($P > 0.05$). Both the Ondansetron (23%) and Granisetron (17%) groups in our research consisted mostly of female participants. And it's about the same in both categories. Four patients in the Ondansetron group (14% of total) and two patients in the Granisetron group (7% of the total) experienced nausea in the first four hours after starting treatment ($P < 0.01$). Two instances (7%) occurred in the Ondansetron group over the observation period of 4-12 hours, but only one occurrence occurred in the Granisetron group during the same time period ($P < 0.05$). One patient in the Ondansetron group (4%), compared to none in the Granisetron group (0%), experienced nausea between 12 and 24 hours after starting treatment. Nausea was most common during the first four hours, and it was more common in the Ondansetron group. Four patients (14% of the total) in the Ondansetron group and two patients (7% of the total) in the granisetron group had vomiting within four hours ($P < 0.01$). There were three incidences of vomiting in the ondansetron group (10%) compared to one occurrence in the granisetron group (4%) in the time period of four to twelve hours ($P < 0.05$). Again, the first four hours had the highest incidences of vomiting, whereas the 12th hour saw no cases of vomiting in either group. Ondansetron users are more likely to need a rescue antiemetic than Granisetron users.

Table 1: Demographic Variables of included patients

Variables	Characteristics	Ondansetron	Granisetron
Age	18-30	24 (80%)	20 (66%)
	31-40	3 (10%)	5 (17%)
	41-50	3 (10%)	5 (17%)
	Mean Age \pm SD	28.63 \pm 7.62	30.23 \pm 9.49
Gender	Male	7 (23%)	5 (17%)
	Female	23 (77%)	25 (83%)
Weight	45-60 kgs	20 (67%)	23 (77%)
	61-70 kgs	10 (33%)	7 (23%)
	Mean weight \pm SD	56.93 \pm 10.62	50.86 \pm 10.85
ASA Physical status	ASA-I	25 (83%)	23 (77%)
	ASA-II	5 (17%)	7 (23%)

Table 2: Type of Procedure of patients

Type of Procedure	Ondansetron	Granisetron
Laparoscopic tubal occlusion (LTO)	18 (60%)	15 (50%)
Laparoscopic Appendicectomy (LAPP)	2 (7%)	6 (20%)
Laparoscopic Cholecystectomy (LCHO)	7 (23%)	5 (17%)
Diagnostic Laparoscopy	3 (10%)	3 (10%)
Laparoscopic Hernioplasty	0 (0%)	1 (3%)

Table 3: Incidence of Nausea & Vomiting

Duration	Ondansetron (n=30)	Granisetron (n=30)
Incidence of Nausea		
0-4hr	**4 (14%)	**2 (7%)
4-12hr	*2 (7%)	*1 (4%)
12-24hr	1 (4%)	0 (0%)
Incidence of Vomiting		
0-4hr	**4 (14%)	**2 (7%)
4-12hr	*3 (10%)	*1 (4%)
12-24hr	0 (0%)	0

* ($P < 0.05$), ** ($P < 0.01$)

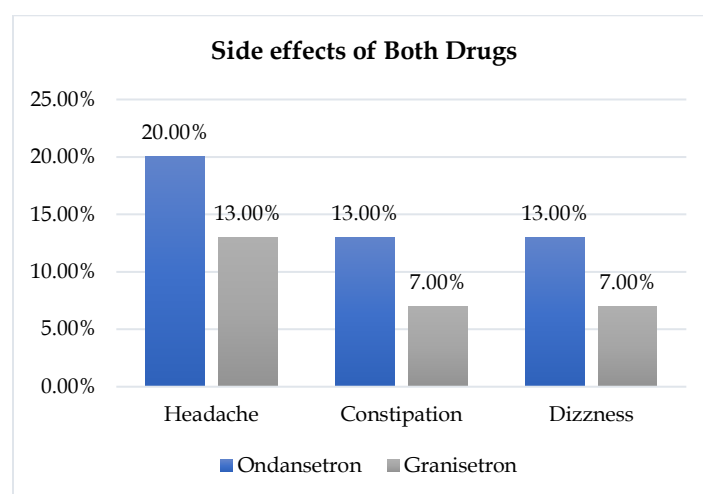
Table 4: Comparison of Rescue Antiemetic

Anesthetic Sequelae	Ondansetron (n=30)	Granisetron (n=30)
Rescue antiemetic	7 (23%)	3 (10%)

Table 5: Clinical Recovery Score (CRS) And Recovery Time (RT)

Time Interval	Ondansetron	Granisetron
0 hour	5.16	5.46
1 Hour	7.03	7.33
2 Hour	8.33	8.46
3 Hour	8.83	9.03
4 Hour	10.33	10.66
Recovery time (Minutes)	5.67 \pm 0.23	5.75 \pm 0.25

Figure 1: Comparison of side effects of both drugs



DISCUSSION

Despite improvements in antiemetic medication, the frequency of PONV after general anesthesia remains significant. The most common side effects of laparoscopic procedures are nausea and vomiting. Patients generally worry more about PONV than they do about discomfort after surgery.¹¹

Our research found that the Ondansetron group had a 25% occurrence of nausea, whereas the granisetron group had an 11% incidence. The present analysis reveals a striking dissimilarity between the first four hours ($P < 0.05$). There is a small but discernible increase in the frequency of nausea between 4 and 12 hours. The number of times people felt sick stopped changing after 12 to 24 hours. Nehra *et al.* (2018) conducted the study. Postoperative nausea and vomiting frequency in the first six hours was shown to be higher¹². Salajegheh *et al.* (2019) found similar outcomes in their research¹³.

In the current trial, 24% of participants taking Ondansetron and 11% using Granisetron experienced nausea and/or vomiting. We found that the first four hours of vomiting were statistically significant ($P < 0.01$) in our research group. In this trial, Compared to Ondansetron, Granisetron has been demonstrated to be more effective in preventing PONV. Bhattacharya found similar things in his research.

The outcomes are statistically significant ($P < 0.05$) between 0 and 4 hours and 4 and 12 hours after surgery. The outcome of being sick for 12 hours was not significant ($P > 0.05$). According to research conducted by Malak *et al.* (2017),¹⁴ administering Ondansetron just before induction has no impact on avoiding PONV. We gave the medicine used in the trial half an hour before the procedure was finished. This increases the duration of the medications' effects after surgery. Similar findings were reached by Chakravarthy *et al.* (2018).¹⁵

Clinical recovery ratings were lower in the metoclopramide group compared to the ondansetron group, which may be attributable to metoclopramide's well-established unpleasant sedative pharmacological effect, as shown in a study by Bestas *et al.*¹⁶ and Gupta *et al.*¹⁷ There was no discernible difference in the occurrence of sleepiness or sedation between both groups. Furthermore, they determined that ondansetron (4 mg) and metoclopramide (10 mg) did not impact the cognitive features after major gynecological surgery since ondansetron did not impair patients' alertness, cognition, or orientation.

According to the findings of our study, the clinical recovery score was noticeably lower in the Ondansetron group in comparison to the Granisetron group; nevertheless, there was no noticeable difference between

the two groups in terms of the length of the recovery process. In our research groups, adverse events occurred at a high rate. In the group that received ondansetron (20%), significantly more people had headaches than those who received granisetron (12%). This difference was statistically significant ($P < 0.05$). The findings of Bhattacharyya and colleagues are consistent with this conclusion.¹⁸ Although the patients in the ondansetron group had a lower clinical recovery score and a shorter recovery period than the patients in the placebo group, there was no statistically significant difference between the two groups.

In the ondansetron group, roughly 7(23%) patients required rescue antiemetic, whereas in the granisetron group, about 3(10%) patients did so. This finding is consistent with that of Malak *et al.* (2017)¹⁴.

Since PONV is not affected by a placebo, we did not include a placebo group in this trial. Since PONV is so upsetting following major surgery, it has been argued that placebo-controlled studies are unethical if effective medications are readily accessible to treat it. The use of prophylactic antiemetic medicine to prevent postoperative nausea and vomiting is supported by the evidence-based therapy of postoperative nausea and vomiting.^{19,20}

After reviewing the available research, they suggested trying antiemetics, particularly those that target the serotonin (5-HT₃) receptor. The recommendations also imply that combination prophylaxis may be useful. Patients at high risk for PONV should get "prophylactic therapy with combination, three or more interventions," as suggested by the panel. Patients undergoing laparoscopic surgery under general anesthesia were given either Granisetron (2 mg i.v.) or Ondansetron (4 mg i.v.) to reduce their nausea and vomiting before the procedure.

CONCLUSION

When used as a preventative measure before laparoscopic cholecystectomy, ondansetron was linked with a higher rate of postoperative nausea and vomiting (PONV) than granisetron.

LIMITATIONS

To determine variations in PONV prevalence, this research used a limited sample size. When compared to earlier research, however, the sample size is adequate.

SUGGESTIONS / RECOMMENDATIONS

Ondansetron and Granisetron can be used in future studies to manage PONV effectively.

CONFLICT OF INTEREST / DISCLOSURE

Nil declared by the authors.

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