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Research Article

Comparison of antiemetic activity of palonosetron with granisetron in postoperative nausea and vomiting after laparoscopic gynaecological surgeries

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ABSTRACT

Background: Granisetron is currently one of the commonly used drugs for prevention of postoperative nausea and vomiting (PONV) which is one of the most common distressing complications of laparoscopic surgeries and anesthesia. Palonosetron has emerged as alternative for PONV in adults. Thus, the study was aimed to conduct a comparison of the efficacy and adverse effects of granisetron with palonosetron to prevent PONV in patients undergoing general anaesthesia for elective laparoscopic gynaecological surgeries.
Methods: This was a prospective, randomized, double blinded and a comparative study and was performed in Lokmanya Municipal Medical College and general Hospital, Sion, Mumbai, India on 60 patients undergoing elective laparoscopic gynaecologic surgeries, requiring general anaesthesia with endotracheal intubation.
Results: Both granisetron 2.5 mg and palonosetron 75 µg are comparable in all respects. They have almost similar incidences in nausea, retching, vomiting and administration of rescue antiemetic at 0-2 hrs, 3 hrs, 12 hrs and 24 hrs postoperatively. The values were not significantly different. The adverse effects seen with both the drugs were not statistically significant.
Conclusions: From the study this can be concluded that both the drugs are effective as prophylactic antiemetic in preventing PONV in laparoscopic gynaecological surgeries which are supposed to be highly emetogenic surgery.

Keywords: Postoperative nausea and vomiting, Laparoscopic gynaecological surgeries, Granisetron, Palonosetron

INTRODUCTION

Postoperative nausea and vomiting (PONV), is reported as the most common distressing complication of laparoscopic surgeries and anesthesia.[1] The various detrimental effects of PONV are including (i) *Physical:* in which retching and vomiting are fairly violent acts and the major problem associated with vomiting in the postoperative period is aspiration of vomitus, respiratory obstruction and aspiration pneumonia; (ii) *Metabolic:* which includes anorexia, dehydration and alkalemia; (iii) *Psychological:* which may cause life-long aversion to surgery as nausea is a very aversive stimulus if induced by operative experience.[2]

Over the years, numerous approaches have been used in the management of PONV. The traditional antiemetics include anticholinergics (scopolamine), phenothiazines (promethazine), benzamides (metoclopramide) and butyrophenones (droperidol) and benzodiazepines (midazolam and lorazepam). The non-traditional antiemetics include ephedrine, propofol and corticosteroids. The newest class of antiemetics used for prevention aud treatment of PONV are serotonin ($5\text{-}HT_3$) receptor antagonists- ondansetron, granisetron,

tropisetron, palonosetron and dolasetron. These antiemerics do uot have adverse effects of older traditional antiemetics.[3] The annual cost of treatment of PONV is very high .Available antiemetics like 5-HT_3 antagonists are effective in very low doses.[4] Thus, costs can be lowered and drug side-effects prevented when given as prophylaxis, lowering the economic burden imposed due to complications and increased medical care resulting from PONV.

Granisetron is currently one of the commonly used drugs for prevention of PONV in adults. New drugs such as Palonosetron have emerged as alternative for PONV in adults. Both have been tried for the prevention of postoperative nausea and vomiting in patients undergoing laparoscopic gynaecological surgeries. Thus, authors were interested to conduct a prospective, randomized, double blind study to compare the efficacy and adverse effects of injection granisetron 2.5 mg with palonosetron 75 µg to prevent PONV in patients undergoing general anaesthesia for elective laparoscopic gynaecological surgeries.

METHODS

This was a prospective, randomized, double blinded and a comparative study and was performed in Lokmanya Municipal Medical College and general Hospital, Sion, Mumbai, India after approval of institutional ethics committee. The study was carried out on total 60 patients undergoing elective laparoscopic gynaecologic surgeries, requiring general anaesthesia with endotracheal intubation. Female patients with an American Society of Anesthesiologist (ASA) physical status of I or II, between the age group of 18 – 65 years were included in the study. Patients with history of motion sickness, patients who have taken antiemetic medication in the past 24 hours and pregnant and lactating women were excluded from the study.

After a complete preanaesthetic evaluation of patient with history, physical examination, relevant investigations, patients were enrolled in the study as per inclusion and exclusion criteria. Procedure of trial was explained to the patients and written informed valid consent was obtained from patients prior to study.

Drug was selected from computer generated random number table. Thirty patients were assigned to each group. Drug was prepared in two syringes by senior anaesthesiologist who was not a part of anaesthesia team and not an investigator. Drugs were prepared as study drug (1) and study drug (2). Two syringes prepared for each patient. Study drug (1) contained granisetron 2.5 mg. Study drug (2) contained palonosetron 75 µg. Each syringe had fixed volume of 2.5 ml. The two syringes were handed over to the investigator. Investigator who checked vital parameter and who collected postoperative data, anaesthesia team, surgeon, patient and nursing staff was blinded to patients group. The patients were given Inj. Granisetron 2.5 mg was grouped as Gropu I and the patients treated with Inj. Palonosetron 75 µg were grouped as Group II. The results were decoded at the end of study for statistical analysis.

Adequate starvation of the patients was confirmed. After taking to the operation theatre monitoring was started in the form of electrocardiogram, pulse oximetry and manual BP monitoring. Intravenous canula inserted and patient premedicated with Glycopyrrolate 0.004 mg/kg injection, inj. Midazolam 0.02 mg/kg, inj. Fentanyl 2 µg/kg. Either of the study drugs was given 5 minutes before induction of anaesthesia.

After preoxygenation for 3 minutes, induction of anaesthesia was done by thiopental 5 mg/kg. Patients were intubated with appropriate size endotracheal tube after muscle relaxation with vecuronium bromide in a dose of 0.08 mg/kg. Anaesthesia was maintained with 33% oxygen in nitrous oxide and propofol infusion for maintenance. Muscle relaxation was maintained by intermittent bolus doses of vecuronium bromide. The patients were mechanically ventilated to keep $EtCO_2$ between 35-40 mm Hg. A nasogastric tube was inserted to make the stomach empty of air and other contents. For laparoscopic surgical procedure, peritoneal cavity was insufflated with carbon dioxide to keep intra-abdominal pressure <14 mmHg. At the end of surgical procedure, residual neuromuscular block was adequately reversed using intravenous glycopyrrolate and neostigmine and subsequently extubated. Before tracheal extubation, the nasogastric tube was suctioned and removed. For postoperative analgesia, intravenous diclofenac 75 mg was given. All patients were observed postoperatively by resident doctors who were unaware of the study drug. Patients were transferred to postanaesthesia care unit and all episodes of PONV (nausea, retching and vomiting) were recorded for 0-2 hour in postanaesthesia care unit and from 3-24 hour in postoperative ward.

Nausea and vomiting were observed postoperatively between 0 hr to 2 hrs, 3 hrs, 12 hrs, and 24 hrs after patient responded to verbal commands. Patients were asked if they felt nauseated in each period, with two possible outcomes: “yes” if they did for at least 10 minutes, or “no”. Every episode of nausea, nausea requiring rescue and vomiting were recorded. These results were assessed by anaesthesiologist in recovery room & nursing staff in general ward who had no knowledge of which antiemetic patient had received. Rescue medication was given to all patients who had demanded rescue for their nausea and for any episode of vomiting, injection metoclopramide 10 mg was given intravenously. Rescue was not repeated till thirty minutes once it was given.

The study was assessed in terms of incidence of PONV (nausea, nausea requiring rescue medication, vomiting), percentage of patients requiring rescue antiemetic,

number of times rescue given, number of patients with complete response (defined as no rescue antiemetic required and no PONV), details of any side effects like headache, dizziness, constipation, myalgia were also observed.

Statistical analysis

Patient's demographic data were analyzed with one way analysis of variance (ANOVA) and student's t test. The incidence of postoperative nausea & vomiting and the incidence of adverse events were compared with non-parametric tests (χ2Fischer's tests). P value < 0.05 was considered as significant. All values were expressed as mean±SD.

RESULTS

The demographic variables of PONV like age, weight and duration of surgery were randomized properly were shown in Table 1 and found no significant differences among these groups. Demographic data of both the groups were comparable. Data expressed in Table 1 is calculated as mean±SD of total values of their respective findings.

The Table 2 shows the distribution of both groups based on ASA status of the patient.27 of the 30 patients(90%) in group I belonged to ASA Grade I and 3 (10%) belonged to ASA GRADE II, while 26 patients out of 30 patients (86.7%) in group II belonged to ASA I and 4 (13.3%) belonged to ASA II. The comparison was carried out using Pearson Chi-Square and Fischer's Exact test and found not significant.

Table 4 indicates the distribution of both groups based on occurrence of nausea, vomiting and rescue antiemetic administration between 0 to 2 hours. 2 of the 28 patients (6.7%) in both had nausea in the 0 to 2 hour postoperative period while nausea was absent in the remaining 93.3%. 5 of the 30 (16.7%) patients in group I and 2 of the 30(6.7%) patients in group II had vomiting in the 0 to 2 hour postoperative period requiring rescue antiemetic. The comparison was carried out using Pearson Chi-Square and Fischer's Exact test and found no significant difference.

Table 1: Demographic data.

	Study Group	N	Mean	Std. Dev	Unpaired T test	P value
Age (years)	Group I	30	34.10	8.372	0.802	0.426
	Group II	30	32.53	6.668	Difference is not significant	
Weight (kg)	Group I	30	54.73	4.906	0.695	0.490
	Group II	30	53.87	4.754	Difference is not significant	
Duration of surgical procedure (min)	Group I	30	88.53	55.827	1.322	0.191
	Group II	30	68.80	59.735	Difference is not significant	

P <0.05 = significant.

Table 2: Comparison of groups based on ASA status.

Study Group		ASA grade		Total
		1	2	
Group I	Count	27	3	30
	Percent	90.0%	10.0%	100.0%
Group II	Count	26	4	30
	Percent	86.7%	13.3%	100.0%
Total	Count	53	7	60
	Percent	88.3%	11.7%	100.0%
Chi-Square test	Value	Df	P value	Association is
Pearson Chi-Square	0.162	1	0.688	Not significant
Fisher's Exact Test			1.000	Not significant

Table 5 presents the comparison of both groups based on occurrence of nausea, vomiting and rescue antiemetic administration after 3 hours postoperatively.0 of the 30 patients (0%) in group I and 2 of the 30 patients (6.7%) in group II had vomiting at the 3 hour postoperative period. Similarly, 1 of the 30 patients (3.3%) in group I and 2 of the 30 patients (6.7%) in group II had vomiting at 3 hour postoperatively requiring rescue antiemetic. The

comparison was carried out using Pearson Chi-Square and Fischer's Exact test and found no significant difference. Table 6 shows the comparison of both groups based on occurrence of nausea, vomiting and administration of rescue antiemetic 12 hours postoperatively. 0 of the 30 (0%) patients in group I and 1 of the 30 (3.3%) patients in group 2 experienced nausea at 12 hours postoperatively. Similarly 2 of the 30 patients in group I and 1 of the 30 patients in group 2 had vomiting and were administered rescue antiemetic 12 hours postoperatively. The values were found to be not significant.

Table 3: Comparison of different laparoscopic surgeries carried out in both groups.

Surgical procedure		Study group		Total
		Group I	Group II	
Cystectomy	Count	3	5	8
	Percent	10.0%	16.7%	13.3%
Cystectomy with oopherectomy	Count	1	0	1
	Percent	3.3%	0.0%	1.7%
Diagnostic laparoscopy	Count	3	8	11
	Percent	10.0%	26.7%	18.3%
Myomectomy	Count	0	1	1
	Percent	0.0%	3.3%	1.7%
Paratubal cyst excision	Count	0	1	1
	Percent	0.0%	3.3%	1.7%
Total hysterectomy	Count	8	6	14
	Percent	26.7%	20.0%	23.3%
Tubal ligation	Count	15	9	24
	Percent	50.0%	30.0%	40.0%
Total	Count	30	30	60
	Percent	100.0%	100.0%	100.0%

Table 4: Comparison of groups based on nausea, vomiting and rescue antiemetic administration between 0-2 hours postoperatively.

Study Group		N (0 to 2 Hrs)		Total	V (0 to 2 Hrs)		Total	R.A. (0 to 2 Hrs)		Total
		Yes	No		Yes	No		Yes	No	
Group I	Count	2	28	30	5	25	30	5	25	30
	Percent	6.70%	93.30%	100.00%	16.70%	83.30%	100.00%	16.70%	83.30%	100.00%
Group II	Count	2	28	30	2	28	30	2	28	30
	Percent	6.70%	93.30%	100.00%	6.70%	93.30%	100.00%	6.70%	93.30%	100.00%
Total	Count	4	56	60	7	53	60	7	53	60
	Percent	6.70%	93.30%	100.00%	11.70%	88.30%	100.00%	11.70%	88.30%	100.00%
Chi-Square test	**Value**	**df**	**P value**	**Association is**	**Value**	**df**	**P value**	**Association is**	**Value**	**df**	**P value**	**Association is**
Pearson Chi-Square	0.000 (b)	1	1	Not significant	1.456	1	0.228	Not significant	1.456	1	0.228	Not significant
Fisher's Exact Test			1	Not significant			0.424	Not significant			0.424	Not significant

N- Nausea; V-Vomiting; R.A. - Rescue antiemetic administration.

Table 7 presents the comparison of both groups based on occurrence of nausea, vomiting and administration of rescue antiemetic 24 hours postoperatively in which 0 out of 30 patients in group I and 1 of the 30 patients in group II had nausea 24 hours postoperatively. 1 of the 30 patients in group I and 1 of the 30 patients in group II had

vomiting and were administered rescue antiemetic postoperatively. Values were statistically not significant.

Table 8 displays the comparison of both groups based adverse effect observed between 24 hour observation periods. The comparison was carried out using Pearson Chi-Square and Fischer's Exact test and found that the values were statistically not significant.

Table 5: Comparison of groups based on nausea, vomiting and administration of rescue antiemetic after 3 hours postoperatively.

Study Group		N (3 Hrs)		Total	V (3 Hrs)		Total	R.A. (3 Hrs)		Total
		Yes	No		Yes	No		Yes	No	
Group I	**Count**	0	30	30	1	29	30	1	29	30
	Percent	0.00%	100.00%	100.00%	3.30%	96.70%	100.00%	3.30%	96.70%	100.00%
Group II	**Count**	2	28	30	2	28	30	2	28	30
	Percent	6.70%	93.30%	100.00%	6.70%	93.30%	100.00%	6.70%	93.30%	100.00%
Total	**Count**	2	58	60	3	57	60	3	57	60
	Percent	3.30%	96.70%	100.00%	5.00%	95.00%	100.00%	5.00%	95.00%	100.00%
Chi-Square test	**Value**	**Df**	**P value**	**Association is**	**Value**	**Df**	**P value**	**Association is**	**Value**	**Df**	**P value**	**Association is**
Pearson Chi-Square	2.069	1	0.15	Not significant	0.351	1	0.554	Not significant	0.351	1	0.554	Not significant
Fisher's Exact Test			0.492	Not significant			1	Not significant			1	Not significant

N- Nausea; V-Vomiting; R.A.- Rescue antiemetic administration.

Table 6: Comparison of groups based on nausea, vomiting and administration of rescue antiemetic after 12 hours postoperatively.

Study Group		N (12 Hrs)		Total	V (12 Hrs)		Total	R.A. (12 Hrs)		Total
		Yes	No		Yes	No		Yes	No	
Group I	**Count**	0	30	30	2	28	30	2	28	30
	Percent	0.00%	100.00%	100.00%	6.70%	93.30%	100.00%	6.70%	93.30%	100.00%
Group II	**Count**	1	29	30	1	29	30	1	29	30
	Percent	3.30%	96.70%	100.00%	3.30%	96.70%	100.00%	3.30%	96.70%	100.00%
Total	**Count**	1	59	60	3	57	60	3	57	60
	Percent	1.70%	98.30%	100.00%	5.00%	95.00%	100.00%	5.00%	95.00%	100.00%
Chi-Square test	**Value**	**Df**	**P value**	**Association is**	**Value**	**Df**	**P value**	**Association is**	**Value**	**Df**	**P value**	**Association is**
Pearson Chi-Square	**1.017**	1	0.313	Not significant	0.351	1	0.554	Not significant	**0.351**	**1**	**0.554**	**Not significant**
Fisher's Exact Test			1	Not significant			1	Not significant			1	Not significant

N- Nausea; V-Vomiting; R.A.- Rescue antiemetic administration.

Table 7: Comparison of groups based on nausea, vomiting and administration of rescue antiemetic 24 hours postoperatively.

Study Group		N (24 Hrs)		Total	V (24 Hrs)		Total	R.A. (24 Hrs)		Total
		Yes	No		Yes	No		Yes	No	
Group I	**Count**	0	30	30	1	29	30	1	29	30
	Percent	0.00%	100.00%	100.00%	3.30%	96.70%	100.00%	3.30%	96.70%	100.00%
Group II	**Count**	1	29	30	1	29	30	1	29	30
	Percent	3.30%	96.70%	100.00%	3.30%	96.70%	100.00%	3.30%	96.70%	100.00%
Total	**Count**	1	59	60	2	58	60	2	58	60
	Percent	1.70%	98.30%	100.00%	3.30%	96.70%	100.00%	3.30%	96.70%	100.00%
Chi-Square test	**Value**	**df**	**P value**	**Association is**	**Value**	**df**	**P value**	**Association is**	**Value**	**df**	**P value**	**Association is**
Pearson Chi-Square	1.017	1	0.313	Not significant	0.000	1	1	Not significant	0.000	1	1	Not significant
Fisher's Exact Test			1	Not significant			1	Not significant			1	Not significant

N- Nausea; V-Vomiting; R.A.- Rescue antiemetic administration.

Table 8: Comparison of groups based on adverse effects during the 24 hour observation period.

Study Group		Headache		Total
		Yes	No	
Group I	Count	2	28	30
	Percent	6.70%	93.30%	100.00%
Group II (Palono)	Count	2	28	30
	Percent	6.70%	93.30%	100.00%
Total	Count	4	56	60
	Percent	6.70%	93.30%	100.00%
Chi-Square test	Value	df	P value	Association is
Pearson Chi-Square	0	1	1	Not significant
Fisher's Exact Test			1	Not significant
Study Group		**Dizziness**		Total
		Yes	No	
Group I	Count	2	28	30
	Percent	6.70%	93.30%	100.00%
Group II (Palono)	Count	0	30	30
	Percent	0.00%	100.00%	100.00%
Total	Count	2	58	60
	Percent	3.30%	96.70%	100.00%
Chi-Square test	Value	df	P value	Association is
Pearson Chi-Square	2.069	1	0.15	Not significant
Fisher's Exact Test			0.492	Not significant
Study Group		**Rashes, allergies**		Total
		Yes	No	
Group I	Count	1	29	30
	Percent	3.30%	96.70%	100.00%
Group II (Palono)	Count	0	30	30
	Percent	0.00%	100.00%	100.00%
Total	Count	1	59	60
	Percent	1.70%	98.30%	100.00%
Chi-Square test	Value	df	P value	Association is
Pearson Chi-Square	1.017	1	0.313	Not significant
Fisher's Exact Test			1	Not significant

DISCUSSION

PONV are frequent and unpleasant symptoms following general anaesthesia. Persistent PONV can cause tension on suture line, venous hypertension, increase bleeding under skin flaps, esophageal rupture and even expose patient to increase risk of pulmonary aspiration of vomitus if airway reflexes are depressed due to residual anaesthetic dosage in body.[5]

Before the specific antiemetics became available various non pharmacological methods like use of ginger root and acupuncture have been tried. The pathophysiology of emesis mainly due to the antagonism of neurohumoral substances like dopamine, histamine, acetylcholine, serotonin and opiods.

Later various antiemetics like Phenothiazines (like chlorpromazine, promethazine, perphenazine and dixyrazine), butyrophenones (like droperiodol), antihistaminics (like diphenhydramine, dimenhydrinate, hydroxyzine and cyclizine), anticholinergics (like atropine and scopolamine), benzamides (like metoclopramide, trimethobenzamide and domperidone) are traditional antiemetics used steroids (like dexamethasone methylprednisolone), cannabinoids (nabilone) and NK1 receptor antagonists (like aprepitant) came to available for prevention and treatment of PONV.[6,7] But these drugs have one or the other side effects mainly sedation, extrapyramidal side effects, and drug interactions.

Hence a new category of drugs 5-HT_3 receptor antagonists like ondansetron was developed in 1984 and it is devoid of these side effects. Later, granisetron, palonosetron, dolasetron of the same category were developed.

In this study, authors have compared prophylactic antiemetic therapy of granisetron at a dose of 2.5 mg with palonosetron at a dose of 75 µg for preventing PONV in patients undergoing laparoscopic gynaecological surgeries. Granisetron is a selective 5 hydroxytryptamine receptor antagonist (5HT_3 RA). This drug is proved as an effective antiemetic agent both in chemotherapy induced and PONV.[8,9] Palonosetron is a selective serotonin subtype 3 (5-HT_3) receptor antagonist with similar use and is found to have a longer duration of action when compared to granisetron.[10,11]

The effectiveness of granisetron is already proved with a dose of 40 µg/kg intravenously in previous studies done by Fujii et al.[12] Its antiemetic efficacy was proved in patients posted for gynaecologic surgery done by Katsuya Mikawa.[13] Fujii et al also carried out a study in 1999 and concluded that granisetron 40 µg/kg was an effective dose for prevention of emesis in patients undergoing thyroidectomy.[14] In an another study Fujii et al evaluated the efficacy of granisetron and ramosetron for preventing PONV in major gynaecologic surgery.[15] Hence authors have decided to use granisetron in a dose of 2.5 mg in this study.

The efficacy of palonosetron was evaluated in a comparative study with ondansetron in a multicenter randomized double blind stratified phase-III done by Lichinitser et al in 2003.[16] By this study it was proved that the newer drug palonosetron was effective compared to ondansteron in case of nausea and vomiting caused by chemotherapy.

The studies conducted by Candiotti et al, Bhattacharjee et al and Park et al also confirmed that the dose of palonosetron 0.075 mg was effective in controlling the PONV.[17-19] By these studies we decided the use the above dosages of drug preoperatively.

In the present study the incidence of nausea was 2 (6.7%), 0 (0%), 0 (0%), 0 (0%) and 2 (6.7%), 2 (6.7%), 1 (3.3%), 1 (3.3%) at 0-2 hrs, 3 hrs, 12 hrs and 24 hrs in the granisetron and palonosetron groups respectively. The incidence palonosetron and granisetron groups though look clinically significant but did not reach statistical significance between these groups. These results matched with the studies done by Fuji et al in 1995.[20] The nausea rates of palonosetron was similar with the studies of Bicer et al, Park et al.[21,19] The results were also similar to the studies performed by Bajwa et al, he compared the prophylactic effects of intravenously (IV) administered ondansetron and palonosetron on PONV prevention in patients undergoing laparoscopic gynecological surgery under general anesthesia and found a postoperative nausea rate of 6.67% after 6 hours postoperatively.[22]

In this study incidence of vomiting and requirement of rescue antiemetic was 2 (6.7%), 0 (0%), 0 (0%), 0 (0%) and 2 (6.7%), 2 (6.7%), 1 (3.3%), 1 (3.3%) at 0-2 hrs, 3 hrs, 12 hrs and 24 hrs in the granisetron and palonosetron groups respectively. The results were found to be not significant and comparable in all aspects. The incidence of vomiting after administration of rescue antiemetic in our study was very low compared to that of studies done by Katsuya et al and Gombar S et al.[13,23] Our results were also comparable with the study performed by Bhattacharjee et al.[18] They did a comparative study between palonosetron and granisetron to prevent postoperative nausea and vomiting after laparoscopic cholecystectomy and inferred that the incidence of a complete response (no postoperative nausea and vomiting, no rescue medication) during 0-3 hrs in the postoperative period was 36.6% with granisetron and 90% with palonosetron, the incidence during 3 – 24 hrs postoperatively was 83.3% with granisetron and 90% with palonosetron and during 24 – 48 hrs, the incidence was 66.6% and 90% respectively ($p<0.05$). The incidence of adverse effects were statistically insignificant between these groups concluding that Prophylactic therapy with palonosetron is more effective than granisetron for long

term prevention of postoperative nausea and vomiting after laparoscopic cholecystectomy.

Adverse effects observed in this study were not clinically serious and did not differ in incidence between the groups. Headache was found in 2 of the 30 patients in both groups. Dizziness was found in 2 of the 30 patients in patients who received preoperative granisetron. Rashes were found in 1 of the 30 patients in the granisetron group. These numbers were neither clinically significant nor statistically significant.

It can be concluded from this study that prophylactic antiemetic use of granisetron 2.5 mg with palonosetron 75 µg are comparable in all respects. They have almost similar incidences in nausea, retching, vomiting and administration of rescue antiemetic at 0-2 hrs, 3 hrs, 12 hrs and 24 hrs postoperatively. The adverse effects seen with both the drugs are not statistically significant. Both the drugs are effective as prophylactic antiemetic in preventing PONV in laparoscopic gynaecological surgeries which are supposed to be highly emetogenic surgery.

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