A Prospective Observational Study Of Dexamethasone Compared With Ondansetron In Preventing Postoperative Nausea And Vomiting In Patients Undergoing Laparoscopic Surgeries Under General Anaesthesia

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Abstract:

Background: Laparoscopic surgery provides tremendous benefits to patients, including faster recovery, shorter hospital stay and prompt return to normal activities. Despite the minimally invasive nature of laparoscopy, high incidence of postoperative nausea and vomiting remains a major challenge for anaesthetist. Postoperative nausea and vomiting (PONV) are common complications after anesthesia and surgery. Postoperative nausea and vomiting are observed in increased frequency after laparoscopic surgery. **Aim:** the aim of this study was to compare the efficacy of intravenous dexamethasone and intravenous ondansetron in preventing postoperative nausea and vomiting (PONV) after laparoscopic cholecystectomy. **Methods:** The study was designed as a hospital-based Prospective observational study 100 patients of ASA physical status I and II of either sex scheduled to elective laparoscopic cholecystectomy under general anaesthesia. The

patients were randomly allocated to two equal groups of 50 each. Group A consisted of patients receiving inj. Dexamethasone 4 mg and in group B patients received inj. Ondansetron 4 mg. Hemodynamic variables were continuously monitored till the end of surgery. Post-operative nausea and vomiting were recorded at 0, 1, 6, 12, 24 hrs after the surgery. **Results:** The frequency of nausea was not statically significantly among the two study groups at different time intervals postoperatively. In group A, 21% of patients had nausea, as compared to 28% in group B ($p > 0.01$). Postoperative vomiting occurred in 12.9% of patients in group A and 10.6% of patients in group B throughout the whole study period ($p > 0.01$). There was no significant difference in the effect by dexamethasone versus ondansetron and both were equally effective against PONV and without any side effects. **Conclusion:** Preoperative intravenous low dose of Dexamethasone reduces the incidence of postoperative nausea and vomiting and is comparable to intravenous Ondansetron. The effects of dexamethasone and ondansetron in preventing PONV were similar after laparoscopic cholecystectomy.

Keywords:

Postoperative nausea and vomiting, Antiemetic, dexamethasone, ondansetron, laparoscopic cholecystectomy.

Introduction:

Nausea and vomiting are undesirable events commonly experienced by patients postoperatively, which are frequently cited as a major cause of patient dissatisfaction with anesthesia.[1] After general anesthesia, the occurrence of nausea and vomiting may lead to prolonged stay of patients in the recovery room and, consequently, to delayed discharge from hospital.[2] These symptoms occur more frequently in the first 24 hours after general anesthesia, with an incidence of up to 80% in patients with associated risk factors and without the use of any prophylactic medication.[3]

Postoperative nausea and vomiting (PONV) is a common distressing symptom in patients undergoing laparoscopic surgery and can contribute to anxiety, dehydration, metabolic abnormality, wound disruption, delayed recovery and other issues. [4] The incidence of PONV varies from 20 to 80 %, and it is an economic and social burden. [5]

Among the drugs that are being used for PONV prophylaxis, 5HT3 antagonists, such as ondansetron, granisetron, palonosetron, and ramosetron, and dexamethasone are the two most commonly used nowadays. However, no drug has been found to provide complete PONV prophylaxis. A number of studies have compared ondansetron with dexamethasone for PONV prophylaxis after laparoscopic surgeries. [6]

It is postulated that ondansetron and other 5- HT3 receptor antagonists exerts its antiemetic action both peripherally (vagus and sympathetic nerves) and centrally

(CTZ and vomiting center) by blocking stimulation of serotonin receptors. Serotonin Receptor Antagonists (SRA) like Ondansetron has a proven efficacy and is recommended as a prophylactic antiemetic at the time of induction of anesthesia. [7]

The precise mechanism of action of Dexamethasone is unknown but it has been proposed that the antiemetic properties arise due to activation of glucocorticoid receptors in the medulla, or by inhibiting central production of prostaglandins or inhibiting the release of endogenous opioids.[8,9] Ondansetron provides significant reduction in early PONV.2 Dexamethasone has been used mainly to reduce late PONV.[10,11,12] Hence, we planned this prospective observational study where ondansetron has been compared with dexamethasone for PONV prophylaxis in patients undergoing laparoscopic surgeries.

Methods:

This prospective observational study was carried out in the Department of Anaesthesia and Critical Care at Government Medical College, Srinagar. After obtaining approval from Hospital Ethics Committee, a written informed consent was taken from the patients for participation in this study, who were recruited from the out-patient department at the time of pre-anesthetic check-up after meeting inclusion criteria.

Profile of 100 patients undergoing elective laparoscopic surgeries was selected randomly. The patients were divided into two groups of 50 each.

Group A (Dexamethasone) 50 cases (4mg diluted 1ml as IV bolus).

Group B (ondansetron) 50 cases (4mg 2ml as IV bolus).

PRE OPERATIVE EVALUATION:

All patients were thoroughly evaluated pre-operatively, one day prior to surgery. It comprised of detailed history (including history of ischemic heart disease, hypertension, bronchial asthma, allergy to any of the drug used), general, physical and systemic examination was done. The necessary and relevant laboratory investigations, like complete haemogram, urine routine, renal function tests, random blood sugar, chest X-ray and electrocardiogram (ECG) were done prior to surgery and proper written consent was confirmed.

In the pre-operative room, the patient's pulse, blood pressure and heart rate was taken, with the patient lying comfortably in supine position.

All the patients were kept nil per oral (NPO) for a period of at least 6 hrs prior to the surgery to avoid the risk of aspiration and other anesthesia related complications.

PRE-ANAESTHETIC MEDICATION AND ADMINISTRATION OF STUDY DRUG:

The patients were brought into the operation theatre. After shifting the patient on the operating table, all the monitors such as NIBP, pulse oximeter, electrocardiogram (ECG), were connected to the patients. Base line vital parameters such as pulse rate (PR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), SPO_2,Resp.Rate and ECG was recorded (T_0) . A good intravenous line was secured (20G) and crystalloids (Ringer's lactate) were started.

Patients were preoxygenated for 3 minutes and were pre-medicated with inj. Glycopyrolate 0.2mg, inj. Midazolam 1mg and inj. Pentazocine .03mg/kg or inj. Fentanyl 2µgm/kgand the said study drug was administered as per the above preparation.

Patients were then given general anaesthesia using Inj. propofol 2mg/kg body weight, Inj. succinylcholine 2mg/kg body weight. Patient were intubated with appropriate ET tube, and tube was fixed after confirming bilaterally equal air entry and capnogram. Anaesthesia was maintained using nitrous oxide (60%) and oxygen (40%), intermittent doses of non-depolarizing muscle relaxants as required and isoflurane (0.5-1%) using intermittent positive pressure ventilation (IPPV) using Bain's circuit. Basic clinical parameters (pulse, NIBP, spO2) were observed during the procedure within 5 minutes of induction and then at intervals of 10 and 15 and 30 minutes.

On completion of surgery patients were to recovery room and then to the respective wards after confirming as adequate level of consciousness and intact reflexes. The incidence of PONV was recorded within first hour, then at intervals of 6 hours, 12 hours and 24 hours post-operatively using PONV score and recording of vitals. (Pulse, NIBP and spO2).

Post- operatively, vitals including pulse rate, non-invasive blood pressure, pulse oximetery using a portable pulse oximeter were monitored again and any signs and symptoms nausea and vomiting were noted using the PONV score at 1 hour, 6 hours, 12 hours and 24 hours interval.

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Conflict of interest: Nil

Results:

Study population was comparable with regard to age, sex, weight and ASA class (Table 1).

Tabe.1:- Demographic profile of the study population:-				
variables	***Group A N=50***	***Group B N=50***	***P Value***	***Remarks***
Age (years)	***45.5±16.254***	***42.9±14.316***	***0.548***	***NS***
Gender M/F	***31/19***	***36/14***	***0.83***	***NS***
Weight	***62.50±9.89***	***63.67±11.74***	***0.72***	***NS***
ASA I/II	***38/21***	***37/13***	***0.341***	***NS***

NS-not significant

The statistical difference among these groups was not significant with respect to the mean values of preoperative heart rate, systolic blood pressure, diastolic blood pressure, oxygen saturation and respiratory rate among the two study groups (table 2).

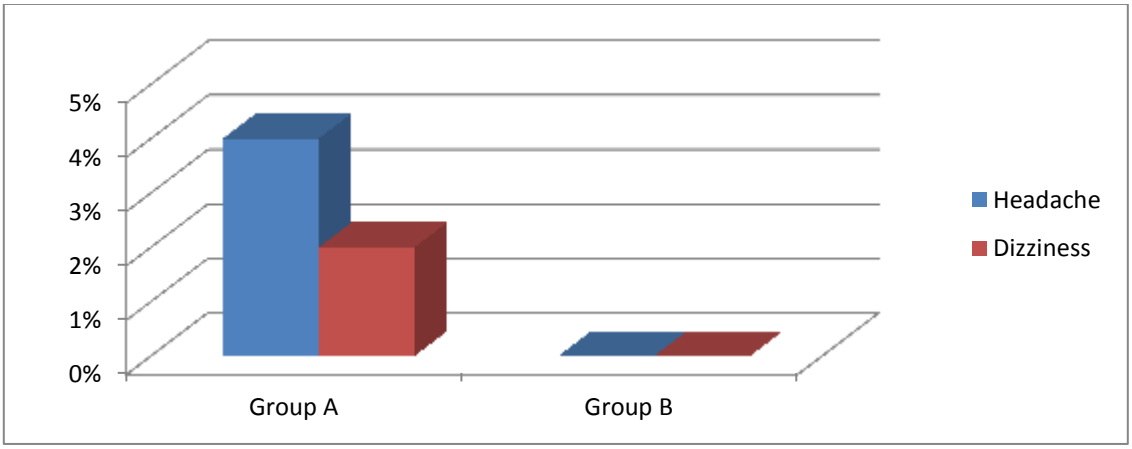
Table .2:- Pre Operative Vitals:-					
Vitals	**Group**	**Mean**	**SD**	**P-value**	**Remarks**
HR (bpm)	**A**	**74.30**	**3.541**	**0.145**	**NS**
	B	**76.40**	**4.122**		
SBP (mmHg)	**A**	**119.05**	**3.052**	**0.07**	**NS**
	B	**120.80**	**2.966**		
DBP (mmHg)	**A**	**76.50**	**2.80**	**0.899**	**NS**
	B	**77.00**	**3.584**		
SPO_2	**A**	**99.15**	**0.745**	**0.711**	**NS**
	B	**99.05**	**0.826**		
PR (pm)	**A**	**14.10**	**1.165**	**0.95**	**NS**
	B	**14.10**	**1.165**		

Mean PONV score within groups were analyzed using Mann Whitney test, the comparison of two groups showed no statistical significance at any time ($p>0.05$) (Table 3).

Table 3: Comparison of PONV score in Group A and Group B

PONV Score	**Group A (n=50)**	**Group B (n=50)**	P Value
	Mean± SD	Mean± SD	
At 1 hr	1.01±0.871	0.91±0.803	0.65
At 6 hrs	1.0±0.83	0.98±0.809	0.87
At 12 hrs	0.29±0.450	0.35±0.556	0.53
At 24 hrs	0.24±0.430	0.36±0.556	0.36

Out of 50 cases in Group A two (4%) patient had headache and one patient (2%) complained of dizziness. As compares with Group B none of patients complained any side effects (Fig 1).



Discussion:

Postoperative period is associated with variable incidence of nausea and vomiting depending on the duration of surgery, the type of anaesthetic agents used (dose, inhalational drugs, opioids), smoking habit etc.[13] 5-HT_3 receptor stimulation is the primary event in the initiation of vomiting reflex.[14] These receptors are situated on the nerve terminal of the vagus nerve in the periphery and centrally on the chemoreceptor trigger zone (CTZ) of the area postrema.[3] Anaesthetic agents initiate the vomiting reflex by stimulating the central 5-HT_3 receptors on the CTZ and also by releasing serotonin from the enterochromaffin cells of the small intestine and subsequent stimulation of 5-HT_3 receptors on vagus nerve afferent fibres.[3]

The present study was carried out to compare the effect of ondansetron and dexamethasone in prevention of PONV in patients undergoing various laparoscopic surgeries as it is known that this procedure increases incidence of PONV. Total 100

patients were enrolled belonging to ASA I and ASA II, between 20 to 60 years undergoing laparoscopic surgeries.

In the current study, we used dexamethasone 4mg and ondansetron 4mg for the prevention of PONV. In **2008, Seong Mo Lim, Kim JY ET. Al** conducted a study to see the effectiveness of an infusion of ondansetron on post-operative emesis in patients receiving IV-PCA after undergoing laparascopic gynecological surgeries. In this study patients were divided into 3 groups receiving a specified dosages of ondansetron mixed with IV-PCA. Group 1 received placebo, Group 2 were put on ondansetron 8 mg and Group 3 received 16 mgs of ondansetron. No significant differences in the incidence of nausea between group 1 and 2 were recorded, the incidence of nausea in group 3, however was substantially lower than in group 1 at 24 h and 48 h after surgery, without much side effects. Hence they concluded that IV-PCA mixed with 16 mg of ondansetron effectively prevented nausea after 24 h to 48 h after gynecologic laparoscopic surgery.

Our study demonstrated that dexamethasone (4 mg) is comparable to ondansetron (4 mg) in the prevention of vomiting in patients undergoing laparoscopic surgeries. This is accordance with the study conducted by**, Soo Yeong Moon et al**. in 2013, on palonosetron with ondansetron in prevention of PONV in patients after gynecological laparoscopic surgery. A profile of hundred non-smoker female patients listed for gynecological laparoscopic surgery were randomly allocated to the palonosetron group (n = 50) or the ondansetron group (n = 50).

In our study the dosage selection of ondansetron (4 mg, i.v.) was based on previous studies done by McKenzie et al..[15] in 1993, Honkavaara P et al..,[16] in 1995 , Kovac et al..,[17] in 1996 and prophylactic ondansetron meta-analysis by Figueredo and Canosa [18] in 1998. Ramosetron 0.3 mg is considered as appropriate dosage for preventing postoperative emesis after anaesthesia. The dosage selection of Ramosetron (0.3 mg, i.v.) was based upon the studies done by Fujii et al..[19, 20]. In addition the manufacturer's recommended dose is 0.3 mg i.v. once a day.[21] The corticosteroid, dexamethasone effectively prevents nausea and vomiting.[22,23]

Dexamethasone aggravates the effect of other antiemetics by various mechanisms like prostaglandin antagonism, release of endorphins and bradykinin reduction .It is recommended at a prophylactic dose of 8 mg i.v. for patients at increased risk for PONV and the dosage selection is based on the study done by Sameer Desai et al..[24], Rajeev V et al.[25] and Elhakim M et al..[26] The recommended timing for administration is at induction of anesthesia rather than at the end of surgery.[23] Studies have shown that ondansetron is more effective in preventing early but not late PONV, whereas dexamethasone was found to have

more pronounced action in the late postoperative period.[27,28,29] This may be due to the shorter duration of action of ondansetron (4 h) in contrast to the prolonged duration of action of dexamethasone.

Conclusion:

Dexamethasone is equally effective as ondansetron for the prophylaxis of post-operative nausea and vomiting in patients undergoing laparoscopic procedures under general anaesthesia. Both not only provide higher levels of satisfaction to patients but also have a safer profile with minimal side effects.

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