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Comparative study of efficacy of intravenous dexamethasone and glycopyrrolate in prevention of PONV with intrathecal bupivacaine with morphine, in lower abdominal surgeries: A prospective randomised double blind study

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Abstract
Introduction: Intrathecal Morphine as adjuvant can provide safe and effective post-operative analgesia for up to 24 hours. Incidence of post-operative nausea vomiting (PONV) after spinal anesthesia is 21%, which increases to 50% when we add opioid (morphine) adjuvant. This study is oriented to search a remedy for PONV and to compare the efficacy of intravenous Dexamethasone and Glycopyrrolate given preoperatively in prevention of PONV with intrathecal hyperbaric bupivacaine with morphine, in lower abdominal surgeries.
Methods: After Ethical committee clearance, Informed written consent was obtained from 60 ASA I or II patients, between ages 18 and 65 years undergoing surgery under spinal anaesthesia and randomized into two groups to receive either injection Dexamethasone 8 mg (Group D) or injection Glycopyrrolate 0.2 mg (Group G) 15 minutes prior to spinal anesthesia with injection bupivacaine 0.5% hyperbaric 15 mg with 100 micrograms preservative free morphine and observed for complete responders, number of episodes of vomiting post operatively over 48 hrs. Pain and sedation assessed by Visual analogue score & Ramsey Sedation Scale respectively. Injection ondansetron 4 mg is used as rescue drug.
Results: Demographic data and hemodynamic variables were similar in all the groups. The incidence of PONV in Glycopyrrolate group was 16% & in Dexamethasone group was 12% with p value 0.5 which was similar.
Conclusion: The efficacy of premedication with i.v. Dexamethasone or Glycopyrrolate in lower abdominal surgeries in prevention of PONV was comparable.

Keywords: PONV, glycopyrrolate, dexamethasone, intrathecal bupivacaine, morphine

Introduction
Postoperative nausea and vomiting (PONV) is a common and unpleasant side effect of anaesthesia and surgery, with risk factors including the female gender, smoking, prior history of motion sickness, the use of volatile agents in general anaesthesia, prolonged surgery, opioid use and a previous history of PONV. There has been a decrease in the incidence of PONV over the years from 60% associated with use of potential emetogenic anaesthetic drugs like ether and cyclopropane to approximately 30% [1, 2]. However, in some high-risk patients the incidence is still as high as 70% [3, 4]. General anaesthesia has long been known as causing a greater frequency and severity of PONV than regional anaesthesia [4].
Currently, a large proportion of surgical procedures are amenable to regional anesthesia, thus increasing its popularity. Since the early 1980s, intrathecal morphine has been used to provide excellent postoperative analgesia following its introduction into central neural blockade [5, 6]. Use of opioids is associated with some major side effects such as PONV, pruritus, urinary retention and respiratory depression.
The etiology of PONV is multifactorial. Patient, anesthesia and surgery related factors have been identified. Various antiemetics have been used for PONV prophylaxis, and to date, no single drug has been found to be totally effective in antagonizing all receptor sites involved in emetic response.
Glycopyrrolate is potent & long acting quaternary antimuscarinic with no central effects. Its antisecretory action on the bronchial & salivary secretions is an additional feature and hence

it is preferred agent in anaesthetic practice [7].

Dexamethasone is a potent and highly selective long acting glucocorticoid. The precise mechanism of its antiemetic action is not known but may be due to prostaglandins antagonism, serotonin inhibition in the gut and release of endorphins. It augments the efficacy & reduce the side effects of other antiemetics [8]. Since 1981, dexamethasone has been reported to be effective in reducing the incidence of emesis in patients undergoing chemotherapy. A study done by Guptha P *et al.* showed the antiemetic effect of dexamethasone to be equal to or better than the 5-HT3 receptor antagonists, such as ondansetron and granisetron [9]. A systematic review by Assente J [10] *et al.* showed that use of single perioperative dose of dexamethasone does not affect wound healing and can be used for prophylaxis of PONV.

According to the data from various studies [11] suggest that, at least in more extensive surgery where effective postoperative pain relief is warranted, intrathecal morphine was not associated with higher PONV rates than opioid based systemic analgesia, especially if a dose of 100 microgram or less was chosen. By undertaking this study we can use safer dose of 100 micrograms of intrathecal morphine to find out the best method to overcome the most unwanted side effect of morphine i.e. nausea and vomiting. Many options are available for the treatment of PONV, among which we chose best of them, easily available & cost effective for our study.

This study was aimed to compare the effectiveness of different group of drugs in prevention of PONV in patients undergoing lower abdominal surgeries using intrathecal bupivacaine with morphine.

Material and Methods

After approval from institutional ethical committee, this prospective randomized double blind study was conducted in a tertiary teaching hospital from March 2018 to October 2019 in patients undergoing lower abdominal surgeries under spinal anaesthesia. Those patients who gave written informed consent of either sex in the age group of 20-60 years with ASA physical status I and II were included in the study. Patients with h/o motion sickness and previous postoperative events, who have taken other antiemetic last 24hrs prior to surgery, GI disorders, pregnancy, with co-morbid disorders &all emergency cases and surgical cases with vomiting as symptom were excluded from the study.

Sample size is calculated as 25 in each group, considering 20% vomiting in Dexamethasone and 10% in Glycopyrrolate group studied by Thomas R *et al.* [12] & Jain R *et al.* [13] keeping power of 90% and alpha error of 5%, so total 50 divided into 2 groups.

After taking written informed consent, patients were allocated into two groups based on computer generated randomized sequence. Their demographic data, history, clinical and systemic examination findings were recorded. Patients were advised to be nil orally for 6 hours. Among 60 patients, 25 patients in each group were given one of the study drugs. The drugs are given intravenously, only once, preoperatively 15 min before spinal anaesthesia.

Group D: Patients received Inj. Dexamethasone 8 mg

Group G: Patients received Inj. Glycopyrrolate 0.2 mg

Spinal anesthesia in the L_2 –$L_{3\ or}$ L_3 –L_4 interspace was given with injection bupivacaine 0.5% hyperbaric 15 mg with 100 micrograms preservative free morphine. The patients and the anaesthesiologist observing the data were blinded. The duration and level of motor and sensory block were noted. Intraoperative monitoring of vital signs – heart rate, blood pressure,SpO_2,respiratory rate is done. Patients were observed for complete responders (no emesis, no rescue antiemetic), Number of episodes of vomiting post operatively over 48 hours (every 15 min till 2 hours. then every 6th hourly for 48 hours). Our Primary Outcome Measure was to control PONV.

Nausea and vomiting was assessed, An emetic episode defined as vomiting or retching or any combination that occurred in rapid sequence of less than 1 min between episodes.

Verbal rating scale for PONV, Nause scale 0 = none, 1 = mild, 2 = moderate, 3 = severe. No. of episodes of vomiting were recorded. Rescue antiemetic given was Inj. Ondansetron 4 mg iv. Pain was assessed by Visual Analogue score (VAS) and Sedation by Ramsay sedation scale.

Statistical analysis was done by means of proportions for categorical/binary variables and mean, Standard deviation for continuous variables which are normally distributed. Inferential statistics was done by using chi square test to compare percentage (proportion) between three groups (e.g. gender, PONV). Fisher exact test was used when expected values in the cells are less than 5. One way ANOVA was used to compare the difference in means between more than two independent groups. Post hoc test within one way ANOVA was used to make intergroup comparisons. Post hoc test (Bonferroni) was used, only when there is $P<0.005$ in one way ANOVA. All the statistical methods were done using SPSS 22.0 version. $P<0.05$ was considered statistically significant. All the graphs were done either in SPSS or Microsoft Excel.

Results

A total of 60 patients were enrolled for the study. There were no exclusion in the study. Demographic data comparing the age, gender, weight, height, ASA grade and type of surgery were comparable between the 2 groups and did not show any significant statistical difference. Mean duration of surgery for patients in Group D was 76.2±14.60, in Group G was 77.40±22.92. (Table 1).

The hemodynamic parameters like HR, SBP, DBP, MAP, SpO_2 were comparable between the 2 groups.

During intraoperative period of our study the incidence of nausea was 2 (8%) and vomiting was 2 (8%) in Dexamethasone group, incidence of nausea was 2 (8%) and vomiting was 1 (4%) in Glycopyrrolate group. There was no significant difference between the two groups. (Table 2, FIG 1).

In our study patients who complained of nausea was followed by vomiting incidence. In first 2 hrs of post-operative period in Dexamethasone group 1 (4%) patients, in Glycopyrrolate group 4 (16%) of patients had PONV. In 2 to 24 hrs, the incidence of PONV was 2 (8%) in Dexamethasone group, and Glycopyrrolate group was symptom free. From 24 to 48 hrs patients in both the groups were free of PONV complaints. Over- all patients in Dexamethasone group had total incidence 12% of PONV and patients in Glycopyrrolate group had 16% incidence of post-operative nausea and vomiting. (Table 3).

Results in Dexamethasone group and Glycopyrrolate group were comparable. Requirement of rescue antiemetic is also

comparable in all the groups. There is no significant difference in Ramsey Sedation Score and Visual Analog Scale between the groups.

Table 1: Comparison of demographic parameters, ASA and duration of surgery

	Group D		Group G		
	Mean	**SD**	**Mean**	**SD**	**P value**
Age (yrs)	41.4	13.8	40.3	9.1	
Weight (kg)	60.12	4.67	60.56	5.17	
Gender (M:F)	9:16		11:14		
ASA-1	9 patients		10 patients		
2	16 patients		15 patients		
Duration of surgery (mins)	76.20	14.60	77.40	22.92	0.8

Table 2: Comparison of intraoperative nausea, vomiting and Ramsey sedation score

Intra operative		**Group D**		**Group G**		
		Count	**Column N%**	**Count**	**Column N%**	**P**
Nausea	No	23	92.0	23	92.0	1
	Yes	2	8.0	2	8.0	
Vomiting	No	23	92.0	24	96.0	0.6
	Yes	2	8.0	1	4.0	
IO Ramsey	1	0	0	1	4.2	0.03
	2	12	48.0	19	79.2	
	3	13	52.0	4	16.7	

Table 3: Comparison of PONV and rescue analgesic

		Group				
		Dexamethasone		**Glycopyrrolate**		
		Count	**Column N%**	**Count**	**Column N%**	**p**
PONV Score Acute 0-2hr	00	24	96.0	21	84.0	0.2
	1.00	0	.0	3	12.0	
	2.00	1	4.0	1	4.0	
PONV Score Late 2 -48hr	00	23	92.0	25	100.0	0.4
	1.00	1	4.0	0	.0	
	2.00	1	4.0	0	.0	
Episodes of vomiting	0	22	88.0	21	84.0	0.5
	1	1	4.0	3	12.0	
	2	2	8.0	1	4.0	
Rescue antiemetic	0	22	88.0	21	84.0	0.7
	1	3	12.0	4	16.0	

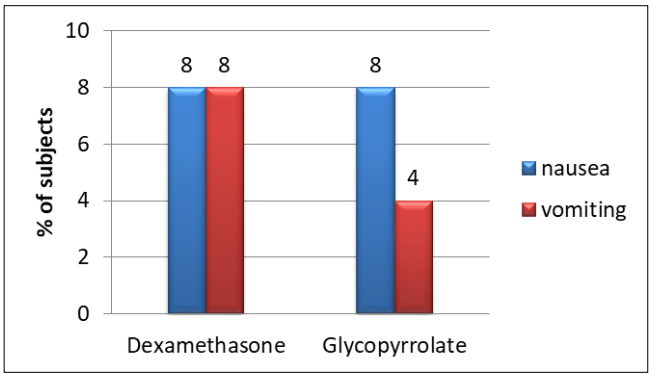

Fig 1: Graph showing intraoperative incidence of nausea and vomiting

Discussion

Post-operative nausea and vomiting are common distressing complications of anaesthesia. Despite the rapid progress in the field of modern anaesthesia, it is continued to be a major factor interfering with postoperative convalescence [9]. In the present study, the treatment groups were similar in terms of patient demographic characteristics, anaesthetic administered and postoperative rescue medication. Therefore, the difference in incidence of PONV between the groups might be attributable to the variation in antiemetic drugs administered.

In this study, on comparison of glycopyrrolate with dexamethasone, both showed similar efficacy in preventing PONV (p value = 0.5), which is not in consistent with the study done by Biswas B N *et al.* [14] which reported that the efficacy of glycopyrrolate was higher when compared to dexamethasone. Their study observed the incidence of nausea and vomiting in patients who received inj. Glycopyrrolate (group A), inj. Dexamethasone (group B), inj. Metaclopramide (group C) and saline (group D).He found that patients who received inj. Glycopyrrolate (group A) incidence of nausea was 2 (10%), vomiting was 1 (5%),total 3 (15%) and complete responders were 17 (85%); patients who received inj. Dexamethasone(group B)the incidence of nausea was 2 (10%), vomiting was 2 (10%), total 4 (20%) and complete responders were 16 (80%); patients who received saline (group D) the incidence of nausea was 8 (40%), vomiting was 3 (15%), total 11 (15%) and complete responders were 9 (45%). The incidence of nausea and vomiting in A, B and C groups were compared with group D (placebo) and it was found that incidence of nausea and vomiting in Glycopyrrolate group was much less compared to all groups.

Dexamethasone was first reported as an antiemetic in patients receiving cancer chemotherapy in 1981, it is a glucocorticoid that produces a strong antiemetic effect by an undetermined mechanism [9, 15]. A wide range of doses of dexamethasone (8-32 mg) has been used in the management of PONV and emesis associated with chemotherapy. Among these doses 8-10 mg has been used most frequently in the prevention of PONV, hence 8 mg dose was chosen for the present study [16].

Cardoso M *et al.* in 2013 [17] studied that during the first 24 hours, nausea occurred in 12/35 (34.4%) patients receiving dexamethasone and in 32/35 (91.4%) receiving placebo ($P<0.001$). During the same time period, vomiting occurred in 12/35 (34.4%) patients receiving dexamethasone and in 29/35 (82.9%) receiving placebo ($P<0.001$). Pain at rest and pain on movement was lower in patients who received dexamethasone at some time points during the study period. In our study there was not much significant difference in VAS score for pain between the groups. Wang JJ *et al.* [18] Found that dexamethasone 8 mg in laparoscopic cholecystectomy decreased the incidence of nausea and vomiting significantly. In a Similar study, J C Huang *et al.* [19] found prophylactic i.v. dexamethasone 5 mg reduces the incidence of postoperative nausea and vomiting in women undergoing ambulatory laparoscopic tubal ligation, and also concluded, dexamethasone 5 mg is more effective than metoclopramide 10 mg or placebo.

This study had few limitations like Discomfort related to morphine were not studied which confounds observation of our study. Larger sample size would have given more specific derivations. To conclude Injection dexamethasone 8 mg (Group D) and injection glycopyrrolate 0.2 mg (Group G) both are equally efficient in prevention of PONV.

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