Indian Journal of Clinical Anaesthesia 2020;7(4):583–588

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Indian Journal of Clinical Anaesthesia

Journal homepage: www.ijca.in

Original Research Article

Effect of 2% dextrose in ringer lactate on incidence of nausea and vomiting in laparoscopic cholecystectomy-Prospective randomized control study

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ARTICLE INFO

Article history:
Received 01-12-2019
Accepted 10-06-2020
Available online 25-11-2020

Keywords:
Post-operative Nausea and Vomiting (PONV)
Laparoscopic cholecystectomy
Intravenous fluids
Ringer lactate

ABSTRACT

Background and Aims: Post-operative nausea and vomiting (PONV) is the distressing situation for patients & caregivers. Various groups of pharmalogical agents are used for prophylaxis in high risk patients for PONV but they have their own advantage and disadvantages. Recent metaanalysis on intravenous use of 5% dextrose showed conflicting results with risk of hyperglycemis. So in this study we plan to use intravenous 2% dextrose in ringer lactate for prevention of PONV in laparoscopic cholecystectomy patients.
Materials and Methods: This prospective randomized double-blind controlled study was conducted in 60 American Society of Anaesthesiologist 1 & 11 patients, age 20-55 years undergoing elective laparoscopic cholecystectomy under general anaesthesia. Patients were randomly divided into two groups: group DRL received 2% dextrose in ringer lactate and group RL received ringer lactate. Allocate fluid was started at induction of anaesthesia and continued post-operatively up to 6hr. Incidence and severity of PONV was measured as a primary outcome. Secondary outcome includes comparison of blood sugar level, requirement of rescue antiemetic, time of oral acceptance of food & time of discharge between two groups. Mean between two groups were compared with student t test. The critical value of 'p' indicating the probability of significant difference was taken as<0.05 for comparison.
Result: Incidence and severity of PONV was less in group DRL than group RL. Blood sugar level was higher in group DRL but within the normal range. Time of oral feed and time to discharge was early in group DRL.
Conclusion: Intravenous 2% dextrose in ringer lactate reduces the incidence and severity of PONV in laparoscopic cholecystectomy patients.

1. Introduction

Post-operative nausea and vomiting (PONV) is the most common problem after anaesthesia and surgery, with a prevalence of about 30%.[1] In postoperative unit, PONV is the unpleasant experience that leads to substantial discomfort and dissatisfaction to patient.[2] PONV can lead to electrolyte imbalance, dehydration, pulmonary aspiration, acid base disturbances & wound dehiscence, and this leads to rise in health care cost due to lengthen hospital stay. Hence identifying the patient at increased risk of PONV and initiating the PONV prophylaxis is of paramount importance. While several factors contribute in higher risk of PONV, cholecystectomy and laparoscopic surgery are associated with higher PONV incidence.[3] The reported incidence rate of PONV in laparoscopic cholecystectomy has ranged from 40% to 75%, so increasing attention should be given for PONV prophylaxis to these groups of patients.[4]

Various trials showed a reduction in incidence of PONV about 20% per therapeutic intervention. Serotonin antagonist, Dopamine antagonist, anticholinergic, dexamethasone etc. are the groups of drugs available for prophylaxis or treatment of PONV. Other interventions to prevent PONV are fluid administration and carbohydrate

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https://doi.org/10.18231/j.ijca.2020.106

loading. Several previous studies had conflicting results on the incidence of PONV and use of perioperative dextrose containing fluids.[5,6] Normal plasma osmolality is 285 to 290 mosm/kg. 5% dextrose is hypotonic with respect to plasma while rests of the fluids are hypertonic as compared to plasma. To avoid changes in normal electrolyte composition and osmolality of plasma we prepared 2% dextrose in lactated ringer solution which has osmolality of 384 mosmol/kg.

So it is important to prevent PONV by starting prophylaxis in high risk cases. Due to very limited and debated evidence that support the effectiveness of IV 5% dextrose administration in the prevention of PONV, the aim of this study was to evaluate the effect of IV dextrose (2% dextrose in ringer lactate) administration for the prophylaxis of PONV after laparoscopic cholecystectomy.

2. Materials and Methods

After obtaining Institutional Ethical Approval (Reference: Dean/2015-16/EC/541 dated 19/01/2017) and written informed consent, this prospective randomized double-blind study was carried out in the Department of Anaesthesiology, Institute of Medical Sciences, Banaras Hindu University, Varanasi, India from March 2017 to March 2018. Sixty adult ASA physical status I and II patients, aged 20-55 years, of either sex scheduled for elective laparoscopic cholecystectomy were included. Patient with history of PONV, smoking, motion sickness, diabetes, hypertension, cardiac, renal or hepatic dysfunction, pregnant patients, obesity (body mass index >30 kg/m2) and prolonged surgery (>30min) were excluded from study. All patients who fulfilled the inclusion criteria were randomly allocated into two equal group (each group, n = 30); Group RL: to receive intravenous ringer lactate and Group DRL: to receive intravenous 2% dextrose in ringer lactate, started just before induction of anaesthesia. Both group received allocated fluid at rate of 3ml/kg/hr intraoperatively and continued postoperatively at rate of 1.5ml/kg/hr for 6hr. The bottles of the study fluid were placed in the sequentially numbered, black opaque plastic bags and sealed to conceal group assignment to the patient, attending anaesthetist, and PACU care provider. An anaesthesiology resident not involved in the study prepared all this bags. 2% dextrose was prepared by adding 20 ml of 50% dextrose into 480 ml of ringer lactate. (it makes 25 times dilution of 50% dextrose to 2% dextrose).

Every patient underwent Pre-anaesthetic check-up and overnight fasting prior to induction of anaesthesia. In operating room standard monitor including electrocardiography, heart rate, non-invasive blood pressure and pulse oximetry were attached and baseline parameters were recorded. All patients were received general anaesthesia using the same protocol. Injection Midazolam (30 mcg/kg) and injection fentanyl (2 mcg/kg) iv were given prior to induction of anaesthesia. Propofol (2mg/kg) was used as induction agent. Anaesthesia was maintained on 50% oxygen in air, isoflurane (1-1.5 minimum alveolar concentration) and intermittent vecuronium & fentanyl. Carbon dioxide was used for pneumoperitoneum and inta-abdominal pressure was kept below 12mmHg. After extubation patient shifted to postoperative care unit for further monitoring. Paracetamol 1.0gm IV infusion over 20min. was used for postoperative pain and repeated 6hrly.

The primary outcome measured was the PONV incidence and intensity immediately at PACU arrival, at 30, 60, 90 & 120 min and at 6, 12 & 24 h after surgery. Secondary outcomes included requirement of rescue antiemetic, time of oral acceptance of feed, discharge time as well as of blood glucose changes between groups. Blood sugar levels were measured using a point of care device ACCU-CHEK (C), Roche Pharmaceuticals, Basel, Switzerland immediately before starting study fluid infusion, and postoperatively at two and six hours. An anaesthesiology resident who was blinded to the study groups assessed the blood glucose level and PONV intensity for each patient. Post-operatively, those patients who had vomiting received 0.1 mg/kg IV ondansetron. All patients were instructed the day before surgery on how to rate the intensity of their nausea using the verbal descriptive scale(VDS); which correlates to visual analogue nausea scores, with an objective measure of severity, where 0 = No PONV: patient reports no nausea and has had no emesis episodes, 1 = mild PONV: patient reports nausea but declines antiemetic treatment, 2 = moderate PONV: patients reports nausea and accepts antiemetic treatment and 3 = severe PONV: nausea with any emesis episode(retching or vomiting).

Statistical analysis were performed using the statistical software SPSS version 16.0 (SPSS Inc., Chicago, IL, USA) software for MS-windows. Descriptive frequencies were expressed using mean ± standard deviation and median (range). Differences between means of continuous variables were compared using the student t test and analysis of variance, as applicable, and that of categorical variables with the Chi-Square test. The critical value of 'p' indicating the probability of significant difference was taken as<0.05 for comparison.

3. Results

Out of 67 eligible patients, 60 completed the study [Chart 1]. Demographic and baseline hemodynamic parameters are comparable between two groups [Table 1]. Comparison of PONV between two groups showed lesser incidence in group DRL. Only 9 (30%) patients in group DRL develop PONV while in Group RL 26 (86%) patient develop PONV and this was statically significant between two groups. [Table 2] Severity of PONV was lesser in group DRL; out

of nine, five patients develop mild & four develop moderate PONV while in group RL; out of 26, 19 patients had moderate & seven had severe PONV and this was statically significant between two groups [Figure 1].

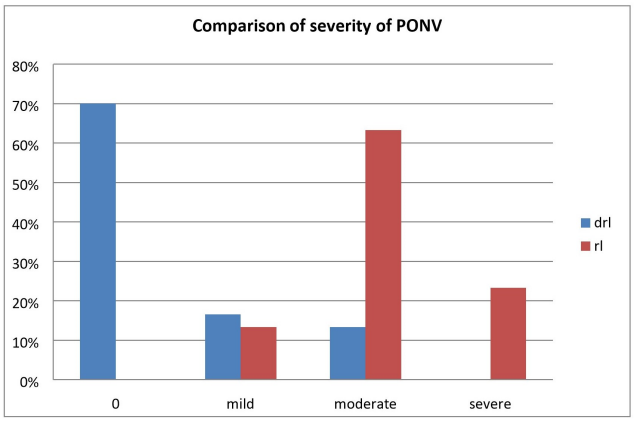

Fig. 1: Comparison of PONV between DRL and RL

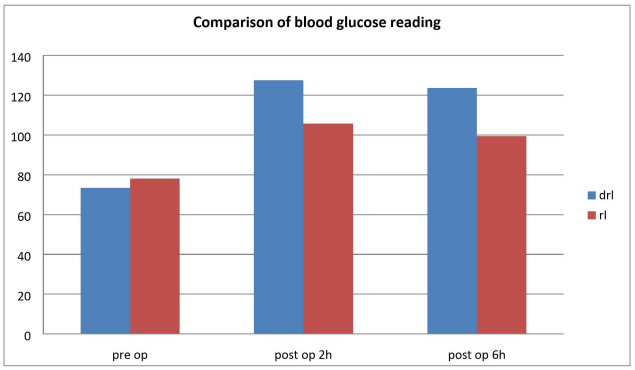

Fig. 2: Comparison of blood glucose reading between two groups

Preoperative baseline blood sugar was comparable between two groups. Postoperatively blood sugar level at 2hr and 6hr was raised and statically significantly between two groups ($p<0.05$) [Figure 2]. Four patients (11.35%) in group DRL while 26 patients in group RL needed one dose of rescue antiemetic and one patient in group RL needed repeat dose of rescue antiemetic [Table 3]. Time of oral acceptance of feed and time of discharge was early in group DRL and this was statically significant between two groups [Table 3]. Intraoperative hemodynamic parameters and oxygen saturation was comparable between two groups.

4. Discussion

In the present study, 2% dextrose in ringer lactate solution started at time of induction of anaesthesia and continued postoperatively resulted in significant reduction in PONV. Blood sugar level was higher in dextrose group but within the normal range up to 6hr postoperatively.

In high risk PONV cases various pharmacological and non-pharmacological approaches have been used but most effective prophylactic regimen has not been determined and search for ideal therapy continue. Antiemetics have side effects like headache, dizziness, constipation, extrapyramidal symptoms and QT prolongation. So universe pharmacological prophylaxis is not seems to be ideal and cost effective. Intravenously 5% dextrose used postoperatively for prevention of PONV with conflicting results, some showed positive response while other showed no effect.[7] A recent metaanalysis by Zorrilla-Vaca A et al[8] concluded that the use of perioperative dextrose did not result in a statistically significant association with postoperative nausea and vomiting but this included the mixed group of patients and all trial used 5% dextrose. A systemic review and metaanalysis by Yokoyama C et al.[9] concluded that compared with placebos, perioperative intravenous dextrose administration may decrease postoperative nausea but not vomiting.

Possible mechanism by which IV dextrose reduce the incidence of PONV is related to reduced gastric acid secretion and reduced insulin resistance post operatively due to hyperglycaemia. In addition, hyperglycemia may raise plasma cholecystokinin, which can modify anxiety and pain through its functions within the brain, in turn decreasing pain and PONV.[10,11] However, there may be an optimal dose of dextrose to obtain this promising outcome because larger quantities of IV dextrose after surgery may increase PONV. We proposed that differences in blood glucose response, may be related to the exact timing of administration, and may contribute to the inconsistent impact of IV dextrose on PONV. It may possible that dextrose administration during emergence from anesthesia could impact the incidence of PONV. So in place of 5% dextrose, we used 2% dextrose in ringer lactate and infusion started at induction of anaesthesia & continued postoperatively up to 6hr.

In our study, the overall incidence of PONV was 58% (35/60) among which 30% were from group DRL and 70.0% were from group RL Our finding was supported by Abolfazl Firouzian et al.[12] they concluded that Administration of IV 5% dextrose in ringer lactate before anaesthesia induction may be recommended as an effective, safe and inexpensive method for the prophylaxis of PONV after laparoscopic cholecystectomy.

Another main finding in our study was that the patients in the dextrose group had significantly higher post-operative blood glucose levels (mean blood sugar level at 2 hrs 127.51mg/dl, and at 6hrs 123.62mg/dl) compared to the control group up to 6th post op hour, though the blood glucose level in all participants were within the normal range. In our study patients receiving dextrose had less duration of post-operative hospital stay (31.5±3.379 hrs) when compared to patients receiving ringer lactate solution

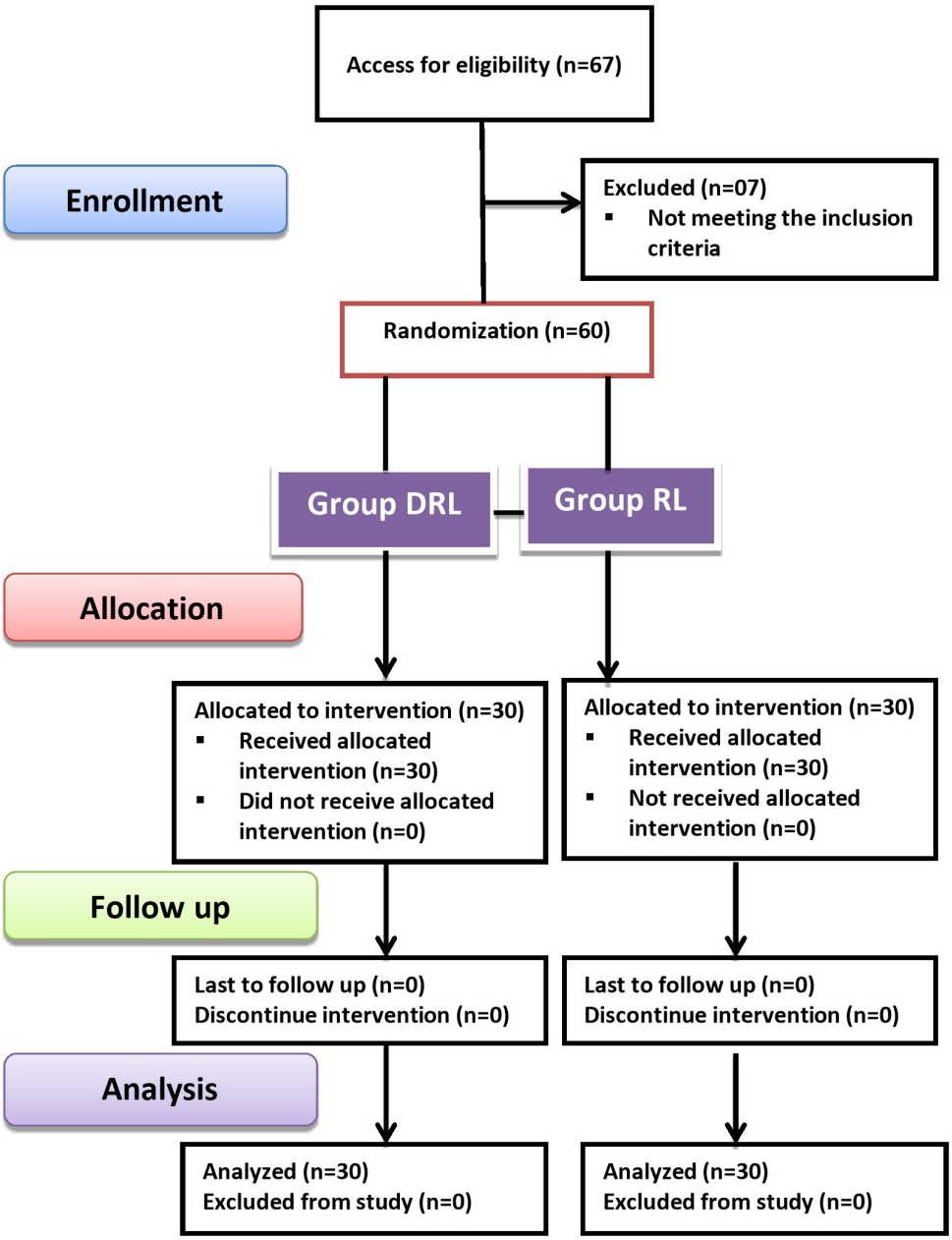

Chart 1: Flow chart of patient studied

Table 1: Comparison of demographic profile and baseline parameters between two groups (n=30)

S.No	Parameters		Group DRL	Group RL	P Value
1.	Age (Year)		39.53±10.81	37.67±12.00	0.53
2.	Weight (Kg)		63.00±7.42	65.40±6.80	0.20
3.	Height (cm)		158.70±8.40	158.57±8.58	0.95
4.	Sex	Male	9 (30%)	5 (20%)	0.86
		Female	21 (70%)	25 (80%)	
5.	Baseline HR (min.)		84.53±6.35	83.9±5.67	0.69
6.	Baseline MAP (mmHg)		76.1±4.66	77.23±4.20	0.33

Data is presented as Mean± standard deviation or percentage. MAP: Mean Arterial blood Pressure; HR: Heart Rate; p<0.05 considered as significant

Table 2: Comparison of PONV between two groups for 24 hours duration (n=30)

PONV Severity	DRL	RL
PONV-0	21 (70%)	0(0%)
PONV Mild -1	5 (16.6%)	4 (11.3%)
PONV Moderate-2	4 (13.4%)	19 (63.4%)
PONV Severe-3	0 (0%)	7 (23.3)%

Data is presented as number or percentage. PONV=Postoperative nausea and vomiting

Table 3: Comparison of requirement of rescue antiemetic, time of oral acceptance of feed & time of discharge between two groups (n=30)

S.No	Parameters		Group DRL	Group RL	P value
1.	Requirement of rescue antiemetic	Single dose	4/30 (11.30%)	26/30 (86.60%)	
		Repeat dose	0/30	01/30	
2.	Time of oral acceptance of feed (hr.)		6.2±0.76	8.66±0.84	<0.001
3.	Time of discharge (hr.)		31.4±3.37	39.46±3.90	<0.001

Data is presented as Mean± standard deviation or percentage or proportion ; p<0.05 considered as significant.

(39.4±4.372). Consistent with our findings, in a study done by Dabu-Bondoc et al[13] had shown a positive effect with administration of post-anaesthesia dextrose-containing IV fluids on the need for subsequent antiemetic use and length of PACU stay in healthy women undergoing outpatient gynecological surgery.[13]

5. Limitation

Our study has several limitations. We evaluated the effect of IV dextrose administration for prevention of PONV in healthy, non-smoking, non-diabetic patients who had undergone laparoscopic cholecystectomy (which constitutes a high-risk group). Our findings may not be generalizable to other populations including patients who undergo surgeries of different duration or in patients with major medical comorbidities or different types of surgery as well as using different types of anaesthesia. We did not measure the intra operative blood sugar. We included both male and female patients of age range from 20-55yr. This may also affect our findings. We did not evaluate post-operative pain as a risk factor for PONV in our study; all patients received the same analgesic regimen after surgery. Finally, the results might be influenced by unknown variables; however, we tried to match known confounding factors.

6. Conclusion

So we conclude that 2% dextrose in ringer lactate reduces the incidence of PONV in laparoscopic cholecystectomy without risk of postoperative hyperglycemia. Further large multicentric randomized control trials are needed on use of 2% dextrose in ringer lactate for prevention of PONV.

7. Source of Funding

Nil.

8. Conflict of Interest

There are no conflicts of interest.

Acknowledgements

We wish to thanks the OT technicians, junior residents from department of anaesthesia, IMS, BHU Varanasi for there support.

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Cite this article: Verma S, Singh AP, Singh Y, Bhartiya SK. Effect of 2% dextrose in ringer lactate on incidence of nausea and vomiting in laparoscopic cholecystectomy-Prospective randomized control study. *Indian J Clin Anaesth* 2020;7(4):583-588.