PREVENTION OF POST OPERATIVE NAUSEA AND VOMITING - A COMPARATIVE STUDY BETWEEN 2%, 5% AND 10% DEXTROSE INFUSION AFTER LAPROSCOPIC SURGERIES

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ABSTRACT

Background: The incidence of PONV could be as high as 70% to 80% in high-risk populations, including feminine sex, obese patients, patients under the age of 40, nonsmokers, patients with a history of PONV, or patients who experience motion sickness, even if the condition is typically self-limiting or treated without side effects.

Objectives: The purpose of the study was to find out which % of dextrose infusion reduced postoperative nausea and vomiting in female patients having laparoscopic cholecystectomy.

Materials and Methods: This prospective, double-blind randomized placebo-controlled study comprised of 180 ASA physical status I and II patients, 18 to 65 years of age, scheduled for laparoscopic cholecystectomy. Patients were arbitrarily divided into three study groups of 60 patients each. Group A received 2% dextrose, group B received 5% dextrose and group C received 10% dextrose. The primary objective of this study was to compare the incidence of PONV in the study treatment groups. The secondary outcomes included measurement of antiemetic medication consumption between groups.

Results: One hundred and eighty patients were enrolled and completed the study. Baseline demographic data of participants including age, ASA class, BMI and duration of surgery were comparable between the two groups and were also statistically non-significant. There was statistically significant difference in PONV score, time to PONV, requirement of

rescue antiemetic and PACU stay in study groups ($p<0.05$) Patient satisfaction was also significantly different between three groups when chi-square test was applied ($p<0.05$)

Conclusion: We believe that using IV dextrose 2%, as low-price antiemetic prophylaxis in patients undergoing any laparoscopic surgeries, provides opportunities for substantial cost saving while preserving efficacy

Keywords: Dextrose 10%, Laparoscopic, Post-operative Nausea Vomiting, Antiemetic, Emesis management.

INTRODUCTION

The first 24 hours following surgery and in the Post Anaesthesia Care Unit (PACU), the term PONV is frequently used to refer to nausea and/or vomiting or retching. Without taking preventative antiemetics, the revealed risk of PONV is estimated to be more than 30%.

Without using preventative antiemetic medicine, PONV is estimated to be more than 30%.The most frequent issue following anaesthesia in laparoscopic procedures is postoperative nausea and vomiting (PONV); the incidence of this condition ranges from 4% to 75%.Even while PONV is typically self-limiting and not fatal, it is unpleasant and causes a great deal of postoperative suffering and unhappiness. Therefore, it is more important from the perspective of patient care, and developing efficient PONV prophylactic measures is essential. Costs associated with pharmaceutical prophylaxis rise, and the start of unfavorable consequences could complicate the patient's condition. Hydration with crystalloid and colloid fluids is one non-pharmacological technique that can help prevent PONV and possibly lessen the need for antiemetics.[1,2]

For the prevention and treatment of PONV, various pharmacological and non-pharmacological approaches have been investigated. Antihistamines, metoclopramide, droperidol, and dexamethasone are only a few of the antiemetic drugs that are now on the market. However, they all have unfavourable side effects, and generally speaking, the most effective preventative measure has not yet been discovered.[3-6]

Perioperative hydration treatment and carbohydrate (dextrose) loading are two recently suggested methods.[7-11] Numerous studies have documented the use of intravenous (IV) dextrose treatment during surgery to lessen the frequency and severity of PONV. Although the precise mechanism is yet unknown, it has been hypothesised that prolonged preoperative fasting may contribute to PONV by causing hypovolemia, which may result in stomach mucosal hypoperfusion. Numerous studies were created to assess the effect of dextrose-rich fluid administration on the frequency and severity of PONV through a mechanism most likely involving hyperglycemia since intravenous fluid loading can improve hypovolemia and consequently hypoperfusion.[12] Data from these many clinical trials are, however, scarce and produce contradictory findings.[13]

Dextrose 10% intraoperative infusion's potential to prevent PONV and lower the need for postoperative antiemetic medicine inspired us to design a double-blind, randomised, controlled experiment. Additionally, to our knowledge, no prior study has looked at the effectiveness of IV dextrose 2%, 5% and 10% administration on the rate and severity of

PONV and the need for rescue antiemetic therapy in this high-risk patient group: female, non-smoking, undergoing laparoscopic procedures

MATERIALS AND METHODS

This prospective comparative randomized double-blind study was conducted in the Department of Anaesthesiology and Critical Care, Padamshree Dr. DY Patil Medical College, Hospital and Research Centre, Pimpri, Pune for a period of six months after receiving institutional ethical approval and written informed consent.

We included ASA grade I and II patients, aged between 18-65 years and those undergoing elective laparoscopic surgery under general anesthesia. We excluded patients with history of PONV, smoking, motion sickness, diabetes, hypertension, cardiac, renal or hepatic dysfunction, pregnant or menstruating patients, obesity (BMI> 30 kg/m2) and prolonged surgery (>2 hours), we also excluded subjects who could not use the verbal descriptive scale (VDS) and those who were receiving an antiemetic agent within 24 hours before surgery or cases wherecomplications occurred during surgery.

One hundred eighty patients who fulfilled the inclusion criteria were randomly allocated into three equal groups (each group, n = 60); Group A: to receive intravenous 2% Dextrose in ringer lactate, Group B: to receive intravenous 5% dextrose in ringer lactate and Group C: to receive intravenous 10% dextrose in ringer lactate, started 30 min prior to induction of anaesthesia.

All the three groups received allocated fluid at the rate of 3ml/kg/hr preoperatively and were continued intra-operatively till the end of surgery. For the purpose of blinding, the label of the study fluids was tagged by a senior anesthesiologist, who was not involved in the study, to prevent observer bias. The bottles of the study fluids were placed in the sequentially numbered, black opaque plastic bags and sealed to conceal group assignment to the patient, attending anaesthetic and PACU care provider.

Every patient underwent Pre-anesthetic check-up and overnight fasting prior to induction of anaesthesia. None of the patient received antiemetic prophylaxis. In preoperative room standard monitor including electrocardiography, heart rate, non-invasive blood pressure and pulse oximetry were attached and baseline parameters were recorded. Baseline blood sugar level were also noted just prior to start of infusion of allocated fluid. All patients received general anaesthesia using the same protocol.

Anesthesia induction was done with Injection Midazolam (20mcg/kg) and injection Fentanyl (2mcg/kg) followed by Injection Propofol (2mg/kg) and injection Atracurium 0.5 mg/kg. Anaesthesia was maintained with Sevoflurane (1MAC) in a 50% oxygen/air mixture and intermittent injection Atracurium and injection Fentanyl. The BIS levels were kept in the 40-60 range. Carbon dioxide was used for pneumoperitoneum and intraabdominal pressure was kept between 12-14mmHg. After extubation patient was shifted to postoperative care unit for further monitoring. Paracetamol 1.0gm IV infusion over 20min was used for postoperative pain and repeated 6hrly to keep VAS score <3 because postoperative painis one of the risk factors for PONV.

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 outcome included requirement of rescue antiemetic (single dose & repeat dose),

time of oral acceptance of feed, PACU stay ,blood glucose changes between groups and verbal scoring system for patient satisfication. Blood sugar levels were measured using a point of care device (CareSens N Blood Glucose Meter, Korea) immediately before starting study fluid infusion, before and after induction of anesthesia followed by 60 min interval, and postoperatively at PACU arrival and at 2& 6 hours. An anesthesiology resident who was blinded to the study groups assessed the blood glucose level and PONV intensity for each patient. Postoperatively, those who developed nausea or 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 and vomiting using the verbal rating/descriptive scale (VDS); which correlates to visual analoguenausea scores, with an objective measure of severity.

VERBAL DESCRIPTIVE SCALE

0 = No PONV: patient reports no nausea and no emesis episodes

1 = Mild PONV: patient reports nausea but declines antiemetic treatment

2 = Moderate PONV: patient reports nausea and accept antiemetic treatment

3 = Severe PONV: nausea with any emesis episode (retching or vomiting)

Statistical Data Analysis:

The data on categorical variables is shown as n (% of cases) and the data on continuous variables is presented as mean and standard deviation (SD). The inter-group statistical comparison of distribution of categorical variables is tested using Chi-Square test or Fisher's exact probability test if more than 20% cells have expected frequency less than 5. The intergroup statistical comparison of means of normally distributed continuous variables is done using independent sample t test. The underlying normality assumption was tested before subjecting the study variables to t test. The entire data is statistically analyzed using Statistical Package for Social Sciences (SPSS version 22.0, IBM Corporation, USA) for MS Windows.

OBSERVATIONS AND RESULTS

One hundred and eighty patients were enrolled and completed the study. Baseline demographic data of participants including age, ASA class, BMI and duration of surgery were comparable between the two groups and were also statistically non-significant (Figure 1).

Figure 1: Bar graph showing mean age, mean BMI and mean duration of surgery.

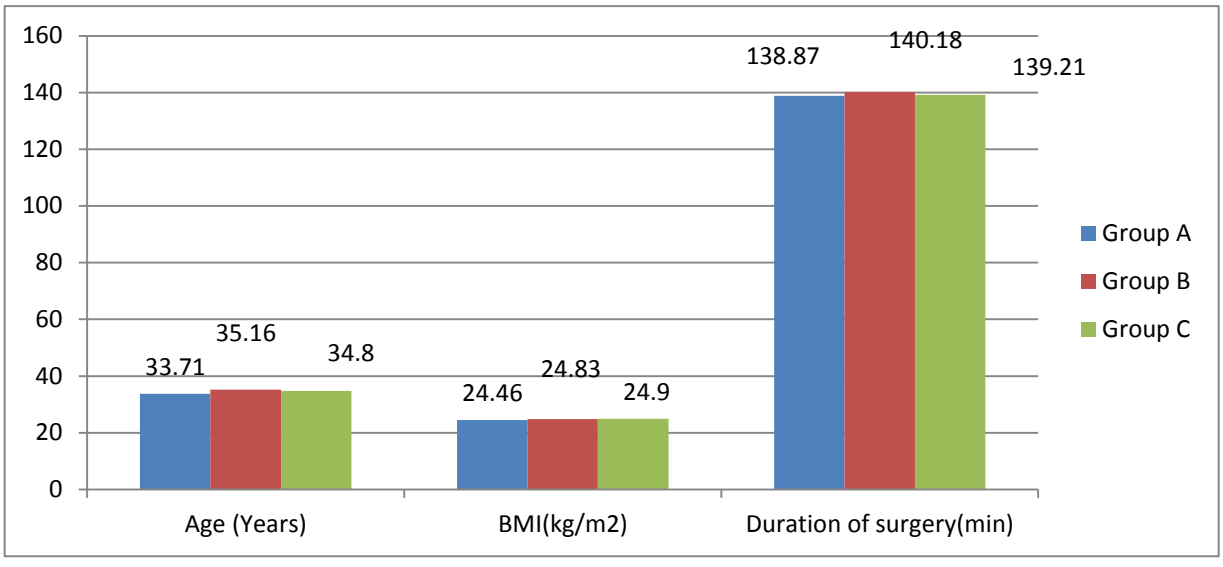

Table 1shows the comparison of incidence of PONV among study groups. There was statistically significant difference in PONV score, time to PONV, requirement of rescue antiemetic and PACU stay in study groups (p<0.05)

Table 1: Comparison of incidence of PONV among study groups

	PONV	Group A	Group B	Group C	P value
PONV Score	Nil	34 (56.7%)	20 (33.3%)	39 (65%)	**<0.001**
	Mild	25 (41.7%)	30 (50%)	0	
	Moderate	1 (1.7%)	4 (6.7%)	21 (35%)	
	Severe	0	6 (10%)	0	
Time to PONV	Immediate after arriving	0	0	13 (21.7%)	**<0.001**
	30 min	55 (91.7%)	50 (83.3%)	16 (26.7%)	
	60 min	5 (8.3%)	10 (16.7%)	31 (51.7%)	
Requirement of rescue antiemetic	Nil	34 (56.7%)	20 (33.3%)	39 (65%)	**<0.001**
	Single dose	26 (43.4%)	34 (56.7%)	21 (35%)	
	Repeated dose	0	6 (10%)	0	
PACU stay <2hours	Yes	49 (81.7%)	24 (40%)	44 (73.3%)	**<0.001**
	No	11 (18.3%)	36 (60%)	16 (26.7%)	

Table 2 shows the comparison of patient satisfaction among study groups. There was statistically significant difference between three groups when chi-square test was applied (p<0.05)

Table 2: Comparison of patient satisfaction among study groups.

Patient satisfaction	Group A	Group B	Group C	P value
Yes	23 (32.7%)	48 (81.8%)	53 (88.3%)	**<0.001**
No	37 (67.3%)	12 (18.2%)	7(11.7%)	

Total	**60 (100%)**	**60 (100%)**	**60 (100%)**	**-**

DISCUSSION

In present study infusion of all three types of fluid, 10%, 5% and 2% dextrose in ringer lactate solution, resulted in reduction in incidence of PONV. However, 10% dextrose infusion was associated with significantly higher blood sugar levels as well as nausea. It was further noted that antiemetic requirement was significantly less in 2% dextrose group.

Initially for PONV management pharmacological means were given but they had various adverse effects as well as were not budget friendly. Later on fluid boluses using crystalloids and colloids were used for PONV to counteract hypervolemia and hypo perfusion as it is one of the cause for PONV. The hypothesis of the present study originated from the apparent ability of carbohydrate or sugar- containing intravenous fluid to reduce the incidence and severity of PONV.[14]

After IV dextrose infusion, hyperglycemia reduces gastric acid secretion which in turn inhibits vagal cholinergic pathway and post-operative insulin resistance that contributes to PONV. In addition, hyperglycemia may increase plasma cholecystokinin, which can modify anxiety and pain through its functions within the brain, in turn decreasing pain and PONV.[1,2] IV dextrose is like a double edged sword ,Optimal dose gives promising outcome while larger quantities may increase PONV.

A systemic review and meta-analysis by Yokoyama C et al.[15] concluded that compared with placebos, perioperative intravenous dextrose administration may decrease postoperative nausea but not vomiting. Therefore, we started study fluid at induction of anaesthesia & continued till end of surgery.

There have been compatible studies showing that 2% and 5% dextrose is effective for reduction of PONV.A bolfazl Firouzian et al.[13] also authenticated our finding, they used IV 5% dextrose before induction of anesthesia. Atashkhoei et al.[16] revealed that the administration of intravenous dextrose reduced the incidence and severity of PONV in patients undergoing laparoscopic surgery and rescue antiemetic treatment. Combined with these earlier studies, our results convincingly indicated that intravenous dextrose administration during laparoscopic surgery was associated with a reduction in the incidence of PONV and antiemetic requirements.

In our study overall incidence of postop nausea and vomiting was similar in both the groups. Our findings are in accordance with Dabu- Bondoc et al.[2], who found a positive effect after administration of dextrose-containing IV fluids in PONV incidence, amount of antiemetic usage and the length of PACUstay.[2,16]

Perioperative hyperglycemia is associated with increased risk of complications such as dehydration, electrolyte disturbances, fluid shifts, ketoacidosis, hyperosmolar states and also the increased risk of mortality and length of hospital stay during the post-operative period after general surgeries.[17] In our study, although the post-operative blood glucose level of the patients in both the groups were within higher normal range but none of the patient required treatment with insulin.

Moreover, nausea and blood glucose level in patients receiving 5% dextrose were significantly high compared to 2% dextrose group and in turn causing more patient

discomfort and delayed oral acceptance of food. Future studies could focus on these potential relationships. One of the reason might be that gastric emptying may be delayed by hyperglycemia which in turn causing gastric fullness and nausea sensation.[14] Dabu-Bondoc et al.[2] applied 1L of dextrose (50gm) infusion for 30 min preoperatively, and noted a decreased incidence of PONV when compared to control group, although the incidence of nausea was still high complimentary to our finding's.

The results of our study were partially consistent with this meta –analysis.[12, 15] Our study showed likewise significant hyperglycemia, need of rescue antiemetic and increased PACU stay with 5% dextroseinfusion.

Another finding noted in our study was that of patients requiring PACU stay (>2 hours) which was markedly lower in 2%dextrose group. PONV is a major contributor to the direct and indirect costs for the institution. It has been shown that occurrence of PONV can lead to additional 47-61 min of patients PACU stay.

CONCLUSION

We believe that using IV dextrose 2%, as low-price antiemetic prophylaxis in patients undergoing any laparoscopic surgeries, provides opportunities for substantial cost saving while preserving efficacy. Furthermore effectual randomized clinical trials are called for to arbitrate the optimum dose of dextrose administration for prevention of PONV and generalizability of our findings.

LIMITATIONS

We included only healthy patients so our results are not generalizable to high risk group of patients with comorbidities and also not for surgeries of longer durations as well as surgeries with different types of anesthesia. Using this method of prophylaxis for PONV in diabetic patients is very promising and requires further research. Even-though two groups received IV fluids with the same protocol, the dosages per kilogram body weight may be unequally distributed between the groups, and thus total volume of IV fluids may be a confounding variable. We did not evaluate post-operative pain as a risk factor for PONV in our study. Finally we tried to match known confounding factors however; the results might be influenced by unknown confounding factors.

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