



Pre-Operative Administration of 5% Dextrose for Prevention of Post-Operative Nausea and Vomiting after Laparoscopic Cholecystectomy

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Abstract

Introduction: *Post-Operative Nausea and Vomiting (PONV) is a common and distressing complication after Laparoscopic Cholecystectomy (LC). New guidelines states that cholecystectomy and laparoscopic surgery are associated with high PONV incidence.*

Methodology: *60 patients belonging to ASA I and II posted for laparoscopic cholecystectomy were divided into two groups. Group A were preloaded with 500 ml Ringer's lactate solution, and Group B with 500 ml 5% dextrose. The post-operative nausea and vomiting was assessed by Visual Analogue Scoring (VAS) system, and rescue antiemetic medication were given to patients with VAS >2.*

Results: *The mean antiemetic consumption in Group A was 2.33 and in Group B was 0.83.*

The mean VAS in Group A was 0.175 and in Group B was 0.051 which is comparatively significant after administration of 5% dextrose. No side effects of hyperglycaemia was noted in the study groups. Inj.ondensetrone prescription rate was low in the study group indicating administration of 5% dextrose is a cost-effective method to prevent PONV.

Conclusion: *administration of i.v dextrose preoperatively is one of the safest, cost effective and prophylactic treatment for PONV after laparoscopic cholecystectomy.*

Keywords: *PONV, Laparoscopic Cholecystectomy, VAS.*

Introduction

Post-operative nausea and vomiting (PONV) is a common and distressing complication after anaesthesia and surgery. It has often been referred to as the big “little problem”, with an incidence of approximately 30%. Modern PONV risk research began in the 1990s with publication of studies using logistic regression analysis to simultaneously identify multiple independent PONV predictors and publication of meta-analyses and systematic reviews.^[1,2] For those posted for surgery PONV is a greater

concern than is post-operative pain and patients continue to rank PONV as the most unfavourable complication. PONV can cause dehydration, electrolyte imbalance, wound dehiscence, pulmonary aspiration and acid-base imbalance and can increase expenditure by increasing patients stay in the post-anaesthesia care unit (PACU) and hospital. Hence, identifying effective strategies for PONV prophylaxis is crucial. While several factors conferring increased risk of developing PONV have been identified, new guidelines state

that cholecystectomy and laparoscopic surgery are associated with higher PONV incidence.^[6]

Likewise, research has demonstrated that PONV incidence is higher after laparoscopic cholecystectomy (LC) than after other types of surgery. In these types of cases, the reported incidence rate of PONV has ranged from 40% to 75%. Considering that patients undergoing LC are at higher risk for developing PONV, increasing attention has been directed towards prophylaxis for PONV in this population.^[7,8]

There are literature stating that female gender post-puberty, non-smoking status, history of PONV or motion sickness, childhood after infancy and younger adulthood, increasing duration of surgery and use of volatile anaesthetics, nitrous oxide, large-dose neostigmine, or intraoperative or postoperative opioids are well established PONV risk factors.

Possible risk factors include history of migraine, history of PONV or motion sickness in a child's parent or sibling, better ASA physical status, intense preoperative anxiety, certain ethnicities or surgery types, decreased perioperative fluids, crystalloid versus colloid administration, increasing duration of anaesthesia, general versus regional anaesthesia or sedation, balanced versus total IV anaesthesia and use of longer-acting versus shorter-acting opioids. Early-phase menstruation, obesity and lack of supplemental oxygen are disproved risk factors. Use of dextrose preoperatively in prevention of PONV has been increasing since and there has been numerous researches going on in this area.

Different pharmacological and non-pharmacological approaches have been used for preventing PONV. Nonetheless, the most effective prophylactic regimen has not been determined, particularly for high-risk patients and the search for the optimal therapy continues.^[9,10]

Methodology

The study was conducted in the department of anaesthesiology, SP Medical College, Bikaner, Rajasthan. After taking approval from the ethical

committee of the institute. Study Design: Double blinded, prospective randomized controlled trial.

Source of Data: Patients posted for laparoscopic cholecystectomy at PBM Hospital, Bikaner

A total of 60 patients posted for laparoscopic cholecystectomy age of age group 18-65 years belonging to ASA I and II were randomized (computer derived random number sequence) into two groups Group A and Group B, 30 patients in each group.

At the waiting hall, patients in Group A received infusion of 500 ml Ringers lactate 30 min before the surgery. Patients in Group B received infusion of 500 ml of 5% Dextrose 30 min before the surgery. All the patients received general anaesthesia using the same protocol. As for pre-medication, all patients received i.v glycopyrrolate 0.2 mg and fentanyl 2 µg/kg before anaesthesia induction. We induced general anaesthesia with thiopentone (2–5 mg/kg) and succinylcholine 2mg/kg i.v and maintained it with oxygen and halothane and vecuronium 0.1mg/kg i.v. All operations were performed using the traditional approach of four skin incisions. Intraoperatively, all patients received IV fluid at the rate of 10ml/kg/h throughout surgery. If a patient systolic blood pressure decreased to 20% of baseline, additional crystalloid solution was administered and they were excluded from the analysis. Post-operatively, maintenance fluid consisted of 0.9% normal saline infused at a continuous rate of 1.5 ml/kg/h. Patients who had vomiting episodes were treated with inj. ondansetron 4 mg I.v stat as rescue anti-medication. The severity of nausea and vomiting was assessed by Visual Analogue Scale (VAS) in postoperative period and associated with dose of antiemetic consumptions.

0 – No nausea/vomiting

1 – Only nausea

2 – Vomiting once (mild or retching)

3 – 2 or more vomiting in 30 min

4 – Persisting nausea more than 2 hr.

Data was entered in MS Excel sheet and was subjected for statistical analysis. Data was presented as n (%) for categorical variables, mean

± SD for normally distributed values and median (interquartile range (IQR)) for skewed numerical variables. Comparison between two groups was performed using Chi-Square test and unpaired t-test. The significance level for tests were determined as 95% (p<0.05). SPSS Statistical 24 for Mac (IBM)

Results

The following observation and inference were made, both the groups were comparable with respect to age and ASA Baseline values of pulse rate, blood pressure. Hemodynamic parameters were stable in both the groups. The Intraoperative Blood Glucose was maintained normal in both Group A (mean of 108.068) and in Group B (mean of 108.51), with a p-value 0.736. In Group B the VAS at 30 min postoperative period was 0.17 and 0.03 at 60 min, 90 min, 120 min and 6th hr. There is a statically significance in VAS (p-value <0.05) in study Group B at 60 min,90 min,120 min 6 hrs postoperative period. Total of fourteen patients in Group A (46.66%) and five patients in Group B (16.66%) required anti-emetic rescue medicines. This difference was very significant in Group B than Group A, but was statistically significant only at 30 min postoperative period, where eight patients in Group A and one patient in Group B received anti-emetic medication (p=0.03). No side effects of hyperglycaemia were noted in our study groups, inj. ondansetron prescription rate was low in our study group indicating preoperative administration of 5% Dextrose is a cost-effective method to prevent PONV.

Table 1

Variables	Group A	Group B
Age (years)	40.6	42.133
Baseline HR (beats/min)	73.166	72
Baseline BG (mg/dl)	95.166	96.133
Weight (kgs)	65.166	67.783
Haemoglobin (gms/dl)	11.483	11.373

(kgs. - kilograms; gms. -grams; dl.- decilitre; mg.-milligrams; min.-minutes)

Table 1. shows the variables among study Group A and Group B based on Age, Baseline HR, Baseline BG, Weight and haemoglobin.

Table 2 Distribution of patients according to Mean Blood Glucose

Intra operative time after induction	Mean Blood glucose (mg/dl)	
	Group A	Group B
0 min	105.27	114.33
5min	108.2	103.83
15min	110.57	115.93
30min	106.1	107.43
45min	110.2	101.03

p-value 0.736

(min.-minutes; dl.- decilitre; mg.-milligrams)

There is no statistical significance in intraoperative Mean Blood Glucose among Group A and Group B. (p value =0.736)

Table 3 Distribution of patients according to Postoperative Blood Glucose

Post-operative time after induction	Blood glucose (mg/dl)	
	Group A	Group B
30min	107.03	106.83
60min	101.63	106.9
90 min	101.97	106.9
120 min	149.1	112.2
6 hrs.	109.37	108.27
12 hrs.	107.5	102.2
24 hrs.	105.73	103.87
p-value	0.989	

(dl.- decilitre; mg.-milligrams; min.-minutes; hrs.-hours)

There is increase in mean blood glucose in Group A at 120 min of postoperative period with a mean of 149.1. There is no such drastic variation in Group B in mean Blood Glucose.

Table 4 Mean VAS score among Group A and Group B

Time	VAS Group A	VAS Group B
30min	0.57	0.17
60min	0.23	0.03
90min	0.17	0.03
120min	0.13	0.03
6hrs	0.1	0.03
12hrs	0	0
24hrs	0.03	0.07

(min.-minutes; hrs.-hours)

In Group A the mean VAS was initially high till six hours following surgery and then reduced at subsequent hours till next 24 hrs of the study.

In Group B the VAS at 30 min postoperative period was 0.17 and 0.03 at 60 min, 90 min, 120 min and 6th hr.

In our study there is a statically significance in VAS (p-value <0.05) in study Group B at 60 min,90 min,120 min 6 hrs postoperative period.

Table 5 Postoperative significance in VAS

Time	p value
30min	0.87
60min	0.7
90min	0.72
120min	0.04
6hrs	0.74
12hrs	
24hrs	0.01

(min.-minutes; hrs.-hours)

There is a significant reduction in VAS at 120 min (p-value 0.04) and at 24 hrs (p-value 0.01)

Table 6 Distribution of patients according to Anti-emetic drug consumption

Post-operative time	Group A	Group B	p-value
30min	8	1	0.03
60min	4	2	0.66
90min	1	1	0.47
120min	1	1	0.47
6hrs	0	0	0
12hrs	0	0	0

(min.-minutes; hrs.-hours)

Total of fourteen patients in Group A (46.66%) and five patients in Group B (16.66%) required anti-emetic rescue medicines. This difference was very significant in Group B than Group A, but was statistically significant only at 30 min postoperative period, where eight patients in Group A and one patient in Group B received anti-emetic medication (p=0.03)

Discussion

The type of surgery also strongly believed to be risk factor for PONV (**Gan TJ et al¹**).

In our study we used inj. thiopentone as induction agent as most commonly used induction agent propofol have additional antiemetic effect, that can overlap results.

Recent studies suggest laparoscopic surgery and gynaecologic surgery and cholecystectomy are independent risk factors for PONV (**Apfel CC et al¹³**) and (**Gan TJ et al¹**). During laparoscopic surgery, CO₂ pneumoperitoneum stimulates mechanoreceptors in the gastrointestinal tract, which leads to the release of serotonin and other neurotransmitters and increases the incidence of PONV.

The pH of gastric juice decreased significantly during laparoscopic cholecystectomy (**Baraka A et al¹⁶**) and this phenomenon might induce gastric contraction (**Agarwal A et al¹⁰**).

Hyperglycaemia can reduce gastric acid secretion by inhibiting the vagal cholinergic pathway (**Loud FB et al¹⁸** and **Lam WF et al¹⁹**).

In our study the post-operative mean blood glucose in Group A was 106.085 and in Group B was 106.738. indicating the blood glucose levels were maintained within normal limits. In our study, the intra-operative blood sugars were maintained within normal limits and the mean intraoperative blood sugar in Group A was 108.068 and in Group B it was 108.51, that does not coincide with (**Abolfazl firouzian et al¹⁵**) who founded out that their Dextrose group had significantly higher post-operative blood glucose level compared to control group.

Cholecystectomy can cause severe duodenogastric reflex strongly associated with early gastric mucosal changes (**Mercan E et al²⁰**). The high osmotic pressure induced by i.v dextrose also can reduce gastrointestinal wall contractions (**Dabu-Bondac S et al¹¹**). Increase blood glucose levels may also increase the plasma level of cholecystokinin, a gastrointestinal peptide hormone that modulates anxiety and pain via its functions within the brain and consequently reduces pain and PONV (**Ljungqvist O et al²¹**).

Although cholecystokinin levels have not been evaluated during cholecystectomy, altered concentrations of this hormone have been detected in patients after cholecystectomy (**McDonnell CO et al²²**)

Many studies have been conducted to evaluate the efficacy of different antiemetic medications in preventing PONV after laparoscopic cholecystectomy, with a variable success rate. Such medication may also be problematic in terms of side effects including hypotension, dysphoria, excessive sedation, hallucination and dry mouth (**Ryu J et al²³**).

In our study the mean antiemetic consumption in Group A is 2.33 and in Group B is 0.83.

From our data, we identified positive correlations between PONV, VAS scores and rescue antiemetic. Although this suggests the high convergent validity of VAS as a tool of rating nausea to other efficacy measures (e.g., rescue antiemetic use) of dextrose, the choice of a best measure as a primary end point for controlled trials similar to ours is still debatable. For example, we only found the number of antiemetics (a secondary outcome) required to achieve the same VAS score was reduced in the 5% Dextrose group. This secondary outcome, despite its importance, is nevertheless not the absolute proof of the dextrose intervention.

Considering the efficacy and safety of ondansetron, most anaesthesiologists considered it as a gold standard of antiemetic therapy in clinical practice (**Chatterjee S et al³, Gan TJ et al⁶, Winston AW et al²⁸**).

It has been shown that the preoperative administration of oral carbohydrate-rich liquid may significantly reduce the incidence of PONV after laparoscopic cholecystectomy and open cholecystectomy (**Sada F et al²⁴**).

In our study the mean post op VAS in Group A is 0.175 and in Group B is 0.051 which is comparatively significant after administration of 5% dextrose solution in Group B.

Reported case of 62 women undergoing outpatient gynaecological surgery (**Dabu Bondoc S¹¹**), in that study, administration of i.v dextrose in balanced salt solution after surgery was associated with similar nausea scores but fewer doses of antiemetic rescue medication compared with plain balanced salt solution.

Our study also showed similar results (i.e.) patients in Group A a total of 14 patients (46.666%) and total of 5 patients in Group B (16.666%) received antiemetic rescue medications.

However, some other studies conducted on patients undergoing LC, coronary artery bypass surgery and thyroidectomy did not confirm this result (**Järvelä K et al²⁵ and Bisgaard T et al²⁶**).

Our study has established the result that 5% dextrose is an effective way of prevention of PONV.

PONV is a major contributor to the direct and indirect cost for the institution. These costs are those that related to the patient's treatment and extended PACU and hospital stay (**Metter SE et al²⁷**).

Our study showed that the ondansetron prescription rate was significantly higher in Group A compared to Group B. The cost of inj. ondansetron in India is 16 Rs and 500 ml of 5% dextrose cost 34 Rs which is considered cost effective in terms of single preoperative administration versus multiple post-operative administration of antiemetics.

Our study has several limitations, as our study group were only ASA I and II, non- smokers, the effect of our study may not be the same in patients undergoing different surgery e.g. ENT procedures of middle ear cavity, ocular procedures, gynaecological laparoscopy, or open laparotomy.

We have not included diabetic patients in our study considering risk benefit ratio, which demands further research. We did not evaluate postoperative pain as a risk factor for PONV.

The second limitation of this study is small sample size. our study produced interesting results in terms of PONV, but statistically not significant in some occasions due to small study group.

Conclusion

Administration of i.v dextrose preoperatively is one of the safest, cost effective and prophylactic treatment for PONV in laparoscopic cholecystectomy.

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Conflicts of Interest: None.

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