MEDICAL CHANNEL

Original Article TRIAL BASE STUDY

IMPACT OF INTRAVENOUS FLUID THERAPY ON POST-OPERATIVE NAUSEA AND VOMITING

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ABSTRACT

Background: Post-operative nausea and vomiting (PONV) being an annoying and irritating side effect of general anesthesia is a leading cause of unanticipated hospital admissions. Therefore its prevention and treatment has always remained a topic of intense research. Among the many causes for PONV, one is said to be the hypovolemic state due to overnight fasting. We therefore carried out this study to evaluate the impact of intravenous fluid supplementations on PONV in patients undergoing laparoscopic cholecystectomy under general anesthesia.
Methods: We recruited 90 female patients in this prospective randomized clinical trial. They were randomly placed in three groups A, B and C where all patients received pre-operative fluid supplementation. In group A all the patients received 2 ml/kg Ringer lactate intravenously (iv), the group B received 10 ml/kg Ringer lactate (crystalloid) iv and the group C received 10 ml/kg hydroxyl ethyl starch (HES) (colloid) iv. In the post-operative period the incidence of PONV was recorded at 2 hours and between 2-24 hours.
Results: The VAS scores in group B and C were significantly less than that of group A patients at both the study times. The lowest incidence of PONV was found in group B followed by the group C. The highest incidence of PONV was in the group A. A significantly larger number of patients (70%) received anti-emetics in the group A as compared to 26.6% and 36.6% patients in group B and C respectively.
Conclusion From our results we conclude that the Preoperative fluid supplementation has the potential to modulate the PONV and anti-emetic requirement in patients at high risk for nausea and vomiting by correcting the intravascular volume deficit.

Keywords: PONV, laparoscopic cholecystectomy, IV.

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INTRODUCTION

Postoperative nausea and vomiting (PONV) has been accompanying general anesthesia in a very high incidence of somewhat 80 percent.[1,2] The consequences of PONV are more far reaching than have been understood affecting the patients in more than one ways producing physical, metabolic, psychological and economic

consequences.[3] PONV has a complex etiology and is considered to be a multifactorial problem.The most reliable independent predictors of PONV are female gender, history of PONV or motion sickness, nonsmoking, younger age, duration of anaesthesia with volatile anaesthetics, and postoperative opioids. The type of surgical procedure also predicts the risk of PONV.[4]

The elective surgeries under general anesthesia necessitate the requirement of overnight fasting. Moreover during surgery the intraoperative anesthetic and surgical losses that are frequently not addressed properly produces a state of hypovolemia. This inturn reduces blood flow to the gut. This reduced blood flow if remains uncorrected will stimulate the release of serotonin which is the most potent trigger of nausea and vomiting.[5]If fluid deficit is timely and adequately addressed then there is improvement in the mesenteric perfusion which prevents ischemia of the gut and ultimately the release of serotonin. In order to correct this fluid deficit that arises in the period of fasting, administration of iv fluids may prove beneficial. It may not only prevent PONV by bringing patients closer to normovolemia but also act as a non-pharmacological approach where the potential side effects of pharmacological strategies including the anti-emetics may also be avoided.[5] This study was thus undertaken to determine the efficacy of iv fluid overloading in preventing PONV.

METHODOLOGY

This prospective clinical trial was conducted in the department of Anesthesiology, Combined Military Hospital Rawalpindi from August 2014 to December 2014. The study protocol was approved by the hospital's ethical committee. 90 female patients with ASA I and II undergoing elective laparoscopic cholecystectomy under general anesthesia were included in the study. A written informed consent was taken from all the patients. 08 patients got excluded from the study; 03 due to the intake of anti-emetics, 03 had history of motion sickness, 02 had nausea and vomiting on the day of surgery. Patients having any renal, cardiac, hepatic or central nervous system disease were also not included in the study. For scoring PONV visual analogue scale was used and all the patients were taught to understand the scoring with this scale in the pre-operative period.[6]If the patient would have no nausea the score would be 0 and with worst nausea as per her imagination it would be 10. Moreover any episode of vomiting would mark the score as 10.

Once the patients were received in the operation theatre an iv line was maintained along with the baseline heart rate, blood pressure and oxygen saturation were recorded. The patients were divided into three groups according to the administration of preoperative iv fluids using computer generated random table.

Group A: Ringer lactate 2 ml/Kg body wt (control group)
Group B: Ringer lactate 12 ml/kg body wt
Group C: 4.5% Hydroxyethyl starch 12 ml/kg body wt

Induction of anesthesia was carried out with Thiopentone sodium (3 mg/kg) after infusing the calculated amount of iv fluid. These were administered by an investigator who was not included in rest of the study.Endotracheal intubation was carried out with pancuronium (0.08 mg/kg). Anesthesia was maintained with the maintenance doses of isofluraneand 60% nitrous oxide in oxygen. At the end of the procedure

TABLE 1:
DEMOGRAPHIC CHARACTERISTICS OF STUDY GROUPS

	Group A(n=30)	Group B(n=30)	Group C(n=30)	*p* value
Age (yrs)	39.30+10.12	40.12+11.23	39.35+11.34	0.948
Body weight (Kg)	66.73+7.88	67.45+8.67	65.34+7.99	0.599
Duration of surgery (min)	88.76+6.88	87.34+7.78	89.54+6.89	0.489
Duration of anesthesia(min)	105.45+10.78	103.34+9.87	104.45+8.70	0.708

Values are Mean + SD; **p* value < 0.05 statistically significant

TABLE 2:
VAS SCORES FOR PONV AT 2 HOURS AND BETWEEN 2-24 HOURS IN THREE GROUPS

	Group A (n=30)	Group B(n=30)	Group C(n=30)	*p* value
At 0-2 hours	4.34+2.77	1.33+1.57	2.25+1.98	0.000*
Between 2-24 hours	2.67+3.56	1.40+0.98	1.30+1.76	0.048*

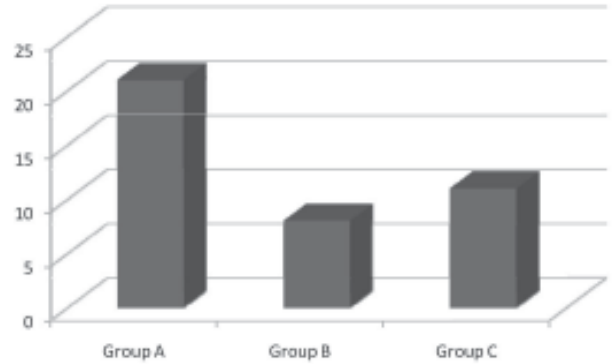
Values are Mean + SD; **p* value < 0.05 statistically significant

TABLE 3
INCIDENCE OF PONV IN THREE GROUPS

	At 0-2 hours % (n)	Between 2-24 hours % (n)	Total % (n)
Group A	46.6 (14/30)	23.3 (7/30)	70 (21/30)
Group B	13.3 (4/30)	13.3 (4/30)	26.6 (8/30)*
Group C	26.6 (8/30)	10 (3/30)	36.6 (11/30)*

**p* value < 0.05 statistically significant

FIGURE 1:
INCIDENCE OF PONV IN THREE GROUPS



isoflurane was discontinued, neuromuscular blockade was reversed with neostigmine (0.05mg/kg) and atropine (0.01 mg/kg). The endotracheal tube was removed after gentle suction of secretions through the tube. The patients were fully recovered in the recovery room and then were shifted to the wards.

The VAS scores for PONV were recorded at 2 hours and between 2-24 hours postoperatively. Incidence of PONV from 0-2 hours postoperatively was labeled as 'early PONV' and that after two hours was labeled as 'late PONV'. These were recorded by blinded investigator in a non-leading manner. Postoperative care was standardized for all patients. Ondansetron in a dose of 4 mg iv was given as a rescue anti-emetic if the VAS became >5 or there was an episode of emesis. Pain was treated with Ketorolac 30 mg iv as required.

TABLE 4
REQUIREMENT OF RESCUE ANTI-EMETIC IN THREE GROUPS

	Group A (n=30)	Group B (n=30)	Group C (n=30)
Patients having vomiting	14	6	8
Patients having VAS>5	7	2	3
Total	21	8*	11*

**p* value < 0.05 statistically significant

Statistical analysis

Data was analyzed using SPSS version 16. Demographic data was analyzed by one way analysis of variance. Intergroup comparison of VAS was done using ANOVA. *p* value <0.05 was considered as significant.

RESULTS

The three groups were comparable with respect to age, body weight, duration of surgery and duration of anesthesia (Table 1).

In the group A the VAS in the first 2 hours was 4.34, in the group B it was 1.33 and in the group C it was 2.25.In group A the VAS in the 2-24 hours was 2.67, in the group B it was 1.40 and in the group C it was 1.30. VAS in groups B and C were significantly lower ($p<0.05$) than that of group A at 2 hours ($p= 0.000$) and between 2-24 hours ($p= 0.048$) (Table 2).

The incidence of PONV was highest in the group A and was significantly different from the group B and C ($p<0.05$) (Table 3; Figure 1).

21 patients in group A, 8 patients in group B and 11 patients in group C required rescue anti-emetics. The difference was statistically different for group A but not for group B and C.

None of our patients developed any complications from the extra amount of fluid administration.

DISCUSSION

Post-operative nausea and vomiting (PONV) is one of the

distressing complications of anesthesia most feared by surgical patients. It has an incidence as high as 80% after laparoscopic cholecystectomies when no prophylactic antiemetic is given.[7]In general anesthesia practice it has always remained a priority to avoid PONV. The prophylactic anti emetics have not been able to successfully control it, besides increasing the risk of side effects and cost of care. Different studies have been carried out where intravenous fluid were given to decrease the incidence of PONV and they have demonstrated the beneficial effect of different types of fluids including crystalloids and colloids fluid supplementation in many surgical procedures.[8]

This prospective randomized controlled study successfully observed the effectiveness of fluid supplementation in significantly reducing the incidence of early and late PONV.[9]We could demonstrate the reduction in PONV with only 10 ml/kg of crystalloid as well as colloids. The same was observed by numerous studies including Magner and his colleagues.[10]Ali *et al*were able to demonstrate a 68% reduction in PONV with small amount of fluid supplementation.[6]Maharaj *et al*., reported the use of large amounts of fluids during laparoscopic surgery, to decrease pain and PONV.[11]Moretti*et al* provide evidence in support of HES solution having a beneficial effect of PONV.[12] We used 4.5 HES (colloid) that usually remains in intravascular compartment for 12-14 hours producing a sustainable effect. It is an isotonic with saline.[13]Chaudary 2006)Ourstudy supports the beneficial effect of colloid in preventing PONV. The number of patients requiring rescue antiemetic was significantly greater in the control group.

We recruited only those patients who were undergoing laparoscopic cholecystectomy for this study in order to get a sample of subjects that have increased risk of PONV. Since in this kind of surgical procedure because of intraperitoneal CO_2 insufflation the abdominal pressure gradually increases which can cause regurgitation. The insufflated CO_2 afterabsorption joins the systemic circulation and may cause hypercarbia. This hypercarbia increases the endogenous catecholamines which inturn increase the risk of nausea and vomiting. [14] Furthermore, the insertion of nasogastric tube can also produce irritation and thus increase the risk of PONV.

Since PONV is affected by many variables, we tried to select the patients and keep a standard anesthesia technique in a way to eliminate all the possible risk factors for PONV. Thus we were able to focus on the effect of only one variable i. e fluid replacement. Since women experience more PONV than men in the postoperative period as reported by therefore we recruited female patients in order to get better estimation of the results.

CONCLUSION

From our results we conclude that the Preoperative fluid supplementation has the potential to modulate the PONV and anti-emetic requirement in patients at high risk for nausea and vomiting by correcting the intravascular volume deficit.

Competing interests

No competing interests and no funding declared.

REFERENCES

1. Park SK, Cho EJ. A randomized, double-blinded trial of palonosetron compared with ondansetron in preventing postoperative nausea and vomiting after gynecological laparoscopic surgery. J International Medical Research, 2011; 39: 399-407.
2. Nisar A, Muslim M, Aurangzeb M. Prevention of postoperative nausea and vomiting in laparoscopic cholecystectomy. J. M. Sci, 2012; 20(1): 33-36.
3. Aziz N, Naz U, Ilyas M. A comparative study between metoclopramide and dexamethasone for prevention of postoperative nausea and vomiting in laparoscopic cholecystectomy. J. Med. Sci, 2011; 19(3): 129-132.
4. Chandrakantan A, Glass PS. Multimodal therapies for postoperative nausea and vomiting and pain. Br. J. Anaesth, 2011; 107 (1): 127-140.
5. Mythen MG, Webb AR. Perioperative plasma volume expansion reduces the incidence of gut mucosal hypoperfusion during cardiac surgery. Arch Surg, 1995;130:423–9.
6. Ali SZ, Taguchi A, Holtmann B, Kurz A. Effect of supplemental pre-operative fluid on postoperative nausea and vomiting. Anesthesia, 2003;58:780–4.
7. Apfel CC, Korttila K and Abdalla M. A factorial trial of six interventions for the prevention of postoperative nausea and vomiting. N Engl J Med, 2004; 350: 2441-51.
8. Schierhout G and Roberts I. Fluid resuscitation with colloid or crystalloid solutions in critically ill patients: A systematic review of randomised trials. BMJ. 1998;316:961–4.
9. McCaul C, Moran C, O'Cronin D, Naughton F, Geary M, Carton E. Intravenous fluid loading with or without supplementary dextrose does not prevent nausea, vomiting and pain after laparoscopy. Can J Anaesth, 2003;50:440–4.
10. Magner JJ, McCaul C, Carton E, Gardiner J, Buggy D. Effect of intraoperative intravenous crystalloid infusion on postoperative nausea and vomiting after gynecological laparoscopy: Comparison of 30 and 10 ml kg-1. Br J Anaesth, 2004;93:381–5.
11. Maharaj CH, Kallam SR, Malik A, Hassett P, Grady D, Laffey JG. Preoperative intravenous fluid therapy decreases postoperative nausea and pain in high-risk patients. AnesthAnalg, 2005;100:675–82.
12. Moretti EW, Robertson KM, El-Moalem H, Gan TJ. Intraoperative colloid administration reduces postoperative nausea and vomiting and improves postoperative outcomes compared with crystalloid administration. AnesthAnalg, 2003;96:611–7.
13. Chaudhary, S., Seithi, A.K., Motiani, P and Adatia, C. Preoperative intravenous fluid therapy with crystalloids or colloids on postoperative nausea and vomiting. Ind J Med Res.2008; 127: 577-581.
14. T. Akkaya, M. M. Sayin, M. Temizsoylu*et al*.The comparison of the postoperative antiemetic and analgesic effects of granisetron and granisetron?+?dexamethasone. Turkish Journal of Reanimation and Anesthesiology, 2001; 29(3): 113–127.