Int J Cancer Manag. 2018 June; 11(6):e67047. doi: 10.5812/ijcm.67047.

Published online 2018 May 16. **Research Article**

The Effect of Fluid Therapy in Acute Post - operative Complications of Breast Cancer; Pain and Post - operative Nausea and Vomiting

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Received 2018 February 03; **Revised** 2018 April 03; **Accepted** 2018 April 08.

Abstract

Background: Post - operative nausea and vomiting (PONV) still continues to be a serious problem. Incidence of PONV is more than 20% to 30%. Intravenous fluid administration seems to decrease PONV.
Objectives: The aim of this study was to evaluate the effect of pre - operative and intraoperative intravenous hydration in comparison to routine hydration on PONV in breast cancer surgery.
Methods: This study was performed on 105 female patients with ASA class grade I and II; they were randomly divided to 3; group 1: routine hydration (1.5 cc/kg/h normal saline). Group 2: routine hydration + 5 cc/kg of ringer lactate serum 80 to 90 minutes before surgery, and group 3: routine hydration + 5 cc/kg post - operative pain, anti - emetic and analgesic administration were compared between 3 groups, using VAS and cortila questionnaire.
Results: There were no significant difference between 3 groups considering demographic data (age, literacy, weight, height, etc.) duration of breast cancer, cancer stage, pre - operative fasting time, duration of surgery, etc. Blood loss was significantly lower in intraoperative fluid supplementation group ($P < 0.05$), but PONV and post - operative pain were significantly lower in those who received pre - operative fluid supplementation. They also needed less anti - emetic or analgesic administration.
Conclusions: Pre - operative fluid supplementation showed to be an effective prophylactic strategy in PONV. Type of fluid and its volume need more evaluation in future studies.

Keywords: PONV, Pain, Crystalloid

1. Background

Post - operative nausea and vomiting (PONV) is nausea, retching, or vomiting occurring during the first 24 to 48 hours after surgery. PONV is the most common cause of patient dissatisfaction after anesthesia. In patient with pharmacological prophylaxis frequency of post - operative nausea and vomiting (PONV) is about 40% to 60% (1-3), and is about 70% to 80% in high risk patients without prophylaxis (4).

The mechanism of PONV is very complex and not completely understood. Brain structures involved in the pathophysiology of vomiting are located throughout the medulla oblongata of the brain - stem, not centralized in an anatomically defined 'vomiting center'. Chemoreceptor trigger zone (CRTZ) is located at the fourth ventricle in the area postrema, and the nucleus tractus solitarius (NTS), in the area postrema and lower pons.

The use of volatile anaesthetics and opioid use increases the risk of PONV about two - fold, with risk increasing in a dose - dependent manner.

Low ASA physical status (I - II), history of migraine, and pre - operative anxiety are predictors of increased risk of PONV.

Body mass index and menstrual cycle phase seem to have no effect on the incidence of PONV.

The strongest predictive factors for PONV are female gender, non - smoking patient, past history of PONV, past history of motion sickness, and intra and post-operative

use of opioids (5). Among these factors, female gender is the greatest risk factor (6). Considering that breast surgery due to breast cancer almost completely done in females, PONV is reported up to 68% during the first 24 hours after surgery (7). The prevention of this complication plays an important role in pre - operative management (1). Also, this unpleasant symptom may cause patient discomfort and dissatisfaction, delayed discharge, and perhaps unplanned hospital re - admissions (8). Sometimes in prolonged cases, it may lead to electrolytes imbalance, dehydration, bleeding, tention on sutures, airway compromise, aspiration pneumonia, emphysema and more medical charges due to prolonged hospital stay (9, 10).

Intravenous hydration has been shown to reduce PONV, but there is no agreement as to which type of fluid or how much is suitable for preventing this complication (11).

Many studies investigated pre - operative venous hydration effect on PONV for PONV prevention (12).

All in all, there is limited information regarding the effect of different intravascular fluid administration. So in this paper, we compared the effect of different ways of administration of pre - operative and intraoperative fluid on PONV in patients undergoing breast cancer surgery.

2. Methods

After the approval of the study by the research ethics committee (Semnan University of Medical Science, Semnan, Iran), all patients, who met the inclusion criteria, were informed about the study and filled the informed written consent.

Ethical code:

IR.SEMUMS.REC.1394.196, IRCT201602116481N8.

Patients with the following criteria were included in this study:

1. Patients who were willing and able to sign the patients' informed consent form.
2. Patients between 18 to 50 years old.
3. Patients who were scheduled for breast cancer surgery.
4. Patients with American Society of Anesthesiologists (ASA) Class of I or II.

The exclusion criteria included patients with a history of psychological disorders, smokers or drug addicted patients, history of cardiovascular disorders or diabetes mellitus, surgery duration more than 2 hours, excessive per - operative blood loss which needed transfusion, history of renal disease, history of motion sickness disease, history of PONV, poor controlled hypertension, weight more than 100 kg, and every other situation which does not allow fluid therapy. This study was conducted at the Shohada - e - Tajrish Hospital, a central teaching hospital in Tehran, Iran. Patients were selected according to the inclusion and exclusion criteria.

A total of 105 patients were randomly classified into 3 groups (35 each) based on random digits table. All of the patients received 1.5 mL/kg normal saline before surgery; also, all patients received 1.5 mL/kg/h normal saline as maintenance fluid therapy and 2 mL/kg/h as third space.

All patients received 3 mL normal saline to replace each 1 mL blood loss. In the first group (routines), serum therapy was as mentioned above and no additional fluids were administered (N = 35). In the second group (pre - operative serum therapy), the patients received 5 mL/kg of ringer lactate serum 60 to 90 minutes before surgery in addition to routine hydration .Finally, in the third group (Intra - operative hydration), the patients received 5 mL/kg of ringer lactate solution during surgery in addition to routine serum therapy.

In 1 hour after recovery discharge also 4, 8, and 24 hours after surgery, the severity of PONV and post - operative pain were assessed, using cortile questionnaire and visual analogue scale (VAS) respectively by someone who did not know the goals of study. Dosage of anti - emetic used for the patients was compared between groups. Anesthesia management was the same for all the patients: After primary hydration, they received 3 μg/kg Fentanyl, 0.02 mg/kg Midazolam, and 1.5 mg/kg Lidocaine as premedication, the induction was done, using 1.5 mg/kg propofol and 0.5 mg/kg atracurium and intubation was done with endotracheal tube of optimum size for each patient propofol was used as maintenance for all of the patients. Bispectral index was held in 40 to 60 range and patients received 6 liter combination of oxygen and air (50% of each). Ten minutes before the end of surgery, all patients received 4mg ondansetrone (iv infusion) and 1000 mg paracetamol (iv infusion) for PONV and post - operative pain prevention, respectively. Revisal of neuromuscular blockade was done with the administration of 0.06 mg/kg Neostigmine and 0.02 mg/kg Atropine at the end of anesthesia. The data were analyzed by SPSS software version 18.

3. Results

A total of 105 women (35 in each group) were evaluated in this study. There was no meaningful difference considering age, literacy, weight, and height of patient ($P > 0.05$). The duration of breast cancer was 6.71 ± 5, 5.17 ± 3.66, and 5.89 ± 3.38 years in routine, pre - operative, and intraoperative fluid therapy groups, respectively, showing no significant difference. Most of the patients were in stage 2 of breast cancer and 3.6 and 6 of them in routine, pre - operative and intraoperative groups had a history of chemotherapy or radiotherapy, respectively.

Pre - operative fasting time, pre - operative, and intraoperative routine serum therapy were also the same in 3 groups.

Intraoperative systolic and diastolic blood pressure, heart rate, respiratory rate, O_2 saturation, and hematocrit levels were not significantly different between the groups.

Although there were no difference in considering the duration of surgery, blood loss was significantly lower in intraoperative serum therapy group ($P = 0.007$).

Nausea, vomiting, and post - operative pain were significantly lower in those patients, who received excessive serum pre - operatively ($P < 0.05$) (Table 1).

Twelve patients (30% - 40%) in first group (routine serum therapy), 8 patients (22.9%) in the third group (intraoperative serum therapy) and only 1 patient (2.9%) in the second group received Metoclopramide and these differences were statistically significant ($P = 0.008$), 31.4%, 17.1%, and 8.6% of patients in 3 groups received Acetaminophen, respectively ($P = 0.048$).

4. Discussion

Post - operative nausea and vomiting (PONV) harmfully influence patient satisfaction. There are multiple different drugs and techniques used in the prevention of PONV.

Three classes of anti - emetic drugs are serotonin antagonists (e.g. ondansetron), corticosteroids (e.g. dexamethasone), and dopamine antagonists (e.g. droperidol). Three other serotonin antagonists, namely granisetron, dolasetron, and palonosetron have the same effect and side - effects.

The D2 receptor antagonist droperidol has a short plasma half - life and we should be given at the end of surgery.

Low dose dexamethasone is the same efficacy against PONV and post - surgical pain.

Neurokinin - 1 receptor antagonists are new class of anti - emetics that were originally developed and useful nausea and vomiting induced during chemotherapy.

Metoclopramide is a widely used D2 antagonist; 25 mg to 50 mg has similar efficacy compared with other anti - emetics; it is not useful at its regular dose (10 mg).

Transdermal scopolamine (a cholinergic drug) administered the night before or the day of surgery has also showed a 40% risk reduction in PONV, but increases visual disturbance three - fold.

If possible, use loco - regional anaesthesia instead of general an - aesthesia. If general anesthesia is required, total i.v. anesthesia with propofol and nitrogen reduces the incidence of PONV by 30%, making this intervention as effective as an anti - emetic drug.

Limiting the pre - operative administration of opioids decreases not only the risk of PONV but also hyperalgesia.

Obeying fasting strategies pre - operatively, patients are routinely hypovolemic in the operating room; so there are many patients experiencing the hypovolemic episodes, which increase the incidence of PONV. Therefore, sufficient hydration is one of the easiest strategies used in the prevention of PONV.

In this study, the effect of pre - operative, intraoperative, and routine hydration on PONV were compared.

It was observed that pre - operative hydration decreases nausea and vomiting more than intraoperative hydration; on the other hand, intraoperative hydration decreased PONV more than routine serum therapy and this difference was statistically significant. Several studies concluded that pre - operative intravenous fluids may be useful for the prophylaxis of PONV (13-15).

4.1. Conclusions

Pre - operative fluid administration with crystalloids caused lower incidence of PONV compared to routine hydration. It also reduced post - operative pain and risk of anti - emetic and analgesic administration.

Table 1. Comparison of Nausea, Vomiting, and Pain in the Three Studied Groups

	Routine, N = 35	Pre - operation Therapy, N = 35	Intraoperation Therapy, N = 35	P Value
Nausea				
1 hour	3.74 ± 1.40	1.66 ± 1.45	2.09 ± 1.84	< 0.001
4 hours	1.91 ± 1.34	0.51 ± 0.61	1.68 ± 0.90	< 0.001
8 hours	0.89 ± 1.02	0.17 ± 0.38	0.66 ± 0.84	0.002
24 hours	0.26 ± 0.44	0.0 ± 0.0	0.0 ± 0.0	< 0.001
Vomiting				
1 hour	1.91 ± 0.89	0.31 ± 0.53	0.46 ± 0.74	< 0.001
4 hours	0.60 ± 0.65	0.0 ± 0.0	0.40 ± 0.65	< 0.001
8 hours	0.14 ± 0.36	0.0 ± 0.0	0.06 ± 0.24	0.056
24 hours	0.03 ± 0.17	0.0 ± 0.0	0.0 ± 0.0	0.368
Pain				
1 hour	3.60 ± 1.12	2.37 ± 1.31	2.37 ± 1.77	0.001
4 hours	1.57 ± 0.88	0.97 ± 0.86	1.74 ± 1.17	0.004
8 hours	1.40 ± 3.52	0.23 ± 0.49	0.83 ± 1.12	0.003
24 hours	0.34 ± 0.54	0.11 ± 0.32	0.14 ± 0.43	0.046

Acknowledgments

None declared.

Footnotes

Authors' Contribution: Mohsen Soleimani: designing the experiment, Mohammad Mohammadi: collecting data and writing the manuscript; Naeime Gholizadeh: analyzing the data; Houman Teymourian: designing the experiment, providing significant advice and consultation and writing the manuscript. Yasmin Khazaei and Farhad Safari: collecting data.

Conflict of Interests: None Declared.

Financial Disclosure: None Declared.

References

1. Golembiewski JA, O'Brien D. A systematic approach to the management of postoperative nausea and vomiting. *J Perianesth Nurs*. 2002;**17**(6):364–76. doi: 10.1053/jpan.2002.36596. [PubMed: 12476402].
2. Wender RH. Do current antiemetic practices result in positive patient outcomes? Results of a new study. *Am J Health Syst Pharm*. 2009;**66**(1 Suppl 1):S3–10. doi: 10.2146/ajhp080465. [PubMed: 19106335].
3. Lichtor JL, Glass PS. We're tired of waiting. *Anesth Analg*. 2008;**107**(2):353–5. doi: 10.1213/ane.0b013e31817b604e. [PubMed: 18633005].
4. Le TP, Gan TJ. Update on the management of postoperative nausea and vomiting and postdischarge nausea and vomiting in ambulatory surgery. *Anesthesiol Clin*. 2010;**28**(2):225–49. doi: 10.1016/j.anclin.2010.02.003. [PubMed: 20488392].
5. Apfel CC, Heidrich FM, Jukar-Rao S, Jalota L, Hornuss C, Whelan RP, et al. Evidence-based analysis of risk factors for postoperative nausea and vomiting. *Br J Anaesth*. 2012;**109**(5):742–53. doi: 10.1093/bja/aes276. [PubMed: 23035051].
6. Bellville JW, Bross IDJ, Howland WS. Postoperative Nausea and Vomiting Iv. *Anesthesiol*. 1960;**21**(2):186–93. doi: 10.1097/00000542-196003000-00009.
7. Gan TJ. Risk factors for postoperative nausea and vomiting. *Anesth Analg*. 2006;**102**(6):1884–98. doi: 10.1213/01.ANE.0000219597.16143.4D. [PubMed: 16717343].
8. Edler AA, Mariano ER, Golianu B, Kuan C, Pentcheva K. An analysis of factors influencing postanesthesia recovery after pediatric ambulatory tonsillectomy and adenoidectomy. *Anesth Analg*. 2007;**104**(4):784–9. doi: 10.1213/01.ane.0000258771.53068.09. [PubMed: 17377083].
9. Chaudhary S, Sethi AK, Motiani P, Adatia C. Pre-operative intravenous fluid therapy with crystalloids or colloids on post-operative nausea & vomiting. *Indian J Med Res*. 2008;**127**(6):577–81. [PubMed: 18765877].
10. Khatiwada S, Bhattarai B, Biswas BK, Pokharel K, Acharya R, Singh SN, et al. Postoperative nausea and vomiting in patients undergoing total abdominal hysterectomy under subarachnoid block: a randomized study of dexamethasone prophylaxis. *Kathmandu Univ Med J*. 2012;**38**(2):41–5.
11. Doherty M, Buggy DJ. Intraoperative fluids: how much is too much? *Br J Anaesth*. 2012;**109**(1):69–79. doi: 10.1093/bja/aes171. [PubMed: 22661747].
12. Dyer RA, Farina Z, Joubert IA, Du Toit P, Meyer M, Torr G, et al. Crystalloid preload versus rapid crystalloid administration after induction of spinal anaesthesia (coload) for elective caesarean section. *Anaesth Intensive Care*. 2004;**32**(3):351–7. [PubMed: 15264729].
13. 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. *Anesth Analg*. 2005;**100**(3):675–82. table of contents. doi: 10.1213/01.ANE.0000148684.64286.36. [PubMed: 15728051].

14. Ali SZ, Taguchi A, Holtmann B, Kurz A. Effect of supplemental preoperative fluid on postoperative nausea and vomiting. *Anaesthesia*. 2003;**58**(8):780–4. [PubMed: 12859471].
15. Gan TJ, Soppitt A, Maroof M, el-Moalem H, Robertson KM, Moretti E, et al. Goal-directed intraoperative fluid administration reduces length of hospital stay after major surgery. *Anesthesiology*. 2002;**97**(4):820–6. [PubMed: 12357146].