

THE IMPACT OF OPERATIVE FLUIDS
ON THE PREVENTION OF POSTOPERATIVE
ANESTHETIC COMPLICATIONS IN
AMBULATORY SURGERY

- High Dose vs Low Dose -

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Abstract

Background/Aim: Adequate control of postoperative (postop.) nausea, vomiting, dizziness and thirst, and early return to normal activity are important anesthetic goals in the context of ambulatory surgery. This study, investigated the impact of different preoperative fluid therapies or regimens on preventing postop. nausea, vomiting, dizziness and thirst.

Materials and Methods: In a prospective randomized double-blind study, from June 2002 to November 2003, two hundred ASA grade I-II ambulatory surgical patients received 20 ml/kg of intravenous isotonic electrolyte solution (0.9% sodium chloride) (group A) or 2 ml/kg of same (group B) (n = 100 in each group), over 30 minutes before induction of anesthesia. A standard general anesthetic technique and postop. analgesia were used throughout the operation. Adverse postop. outcomes (nausea, vomiting, dizziness, and thirst) were assessed at 30 and 60 minutes postop. and at discharge.

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Results: The incidence of postop. vomiting and thirst significantly decreased in group A compared to group B ($p = 0.014$ and $p = 0.029$, respectively). There was no difference in the incidence of nausea and dizziness between the two groups.

Conclusion: We conclude that preoperative high dose hydration (20 ml/kg bolus) can efficiently decrease the incidence of postop. thirst and vomiting within the first 60 minutes, it was superior to low dose hydration and therefore, we recommend it in ambulatory surgeries.

Key words: Ambulatory surgery, vomiting, nausea, thirst, dizziness, preoperative hydration, postoperative anesthetic complications, antiemetic.

Introduction

In the past decade dramatic increase in ambulatory surgery has been observed. In recent years, up to 80% of patients in the United States are being admitted on the day of surgery¹. Ambulatory surgery and anesthesia can offer a large number of advantages to patients, health care providers and hospitals. However, it is unfortunately associated with a number of unpleasant postoperative experiences such as pain, nausea, vomiting, dizziness and thirst. Short acting anesthetic agents have provided major advantages in the field of acute pain. However, despite the availability of new antiemetic agents, the incidence of other postoperative adverse effects, especially nausea and vomiting, has remained significantly unchanged².

Nausea and vomiting are the most common and distressing symptoms associated with surgery and one of the most common reasons for poor patient satisfaction-rating, in the postoperative period³. Currently, the overall incidence of postoperative nausea and vomiting for all surgeries and patients is estimated to be 25-30%⁴. Postoperative nausea and vomiting may be associated with serious complications such as dehydration, electrolyte disturbances, wound dehiscence, pulmonary aspiration and esophageal rupture leading to a delay in post-anesthesia recovery room discharge and thereby increasing medical costs⁵.

Recent studies have demonstrated that preoperative hydration of patients undergoing in-patient and out-patient surgeries can decrease the incidence of postoperative adverse outcomes^{4,6-8}. However, the isotonic solution used in those studies are not easily accessible to our patients and in our setting.

The aim of this study was to investigate the efficacy of preoperative hydration with 0.9% sodium chloride (an easily available fluid in our setting) in decreasing and preventing postoperative nausea, vomiting, thirst and dizziness.

Materials and Methods

In a prospective randomized double-blind clinical trial, from June 2002 to November 2003, two hundred ASA grade I-II ambulatory surgical patients, who had been referred for surgery to the educational hospitals of Shiraz University of Medical Sciences, were studied. A written informed consent was obtained from each patient and the Shiraz University of Medical Sciences Research Committee had approved the study.

Patients' age ranged from 17 to 60 years and they were scheduled for general, orthopedic and gynecologic surgeries. Patients who gave positive history of cardiovascular diseases, diabetes, preoperative history of nausea, vomiting or dizziness and motion sickness, were excluded from the study. Demographic characteristics, type of surgery and history of drug consumptions, were recorded.

Two hundred patients (77 males, 123 females) were randomly allocated to two equal groups of 100 each. The first group (group A) received 20 ml/kg of intravenous 0.9% sodium chloride (sodium chloride, 154 mEq/L). The second group (group B) received 2 ml/kg of the solution. The fluid was given as bolus over 30 minutes before induction of anesthesia.

A standard general anesthetic technique and postoperative analgesia were used throughout the operations. Induction was done with diazepam (0.1 mg/kg) and morphine (0.15 mg/kg). Endotracheal intubation was

accomplished with 1.5 mg/kg of succinylcholine and 4 mg/kg Pentothal. Anesthesia was maintained with a mixture of oxygen (50%) and nitrous oxide (50%) with end-tidal halothane (0.5 MAC) in a semi closed circle system. Atracurium (0.3 mg/kg IV) was used for muscle relaxation. Neuromuscular block was reversed with neostigmine (50 µg/kg) and atropine (25 µg/kg). All patients received a maintenance IV fluid therapy of isotonic saline, 1 ml/kg/hour, throughout surgery and during the postoperative period. If more fluid was needed, due to hypotension or bleeding, the patient was excluded from the study.

Blood pressure, heart rate, oxygen saturation, electrocardiogram, tidal volume, end-tidal CO₂, end-tidal concentration of the inhaled anesthetic, airway pressure, and minute volume, all were monitored.

Adverse postoperative outcomes (nausea, vomiting, dizziness, and thirst) were assessed by an anesthesiologist, at 30 and 60 minutes postoperatively and at discharge. Nausea was defined as subjective complain of nausea with increase in salivary secretion; vomiting, as active retching and active vomiting of gastric content; dizziness as subjective complain of faintness and inability to sit in bed or walk without support; and thirst, as a desire to drink and dry mucosa of the mouth. The anesthesiologist assessing the adverse outcomes, the attending anesthesiologist, and recovery room nurses were all blind to the patients' allocation group and the amount of preoperative fluid therapy they had received.

All data were analyzed and computed by SPSS (Chicago, IL) software, version 10.0, and Microsoft EXCEL (Microsoft, Redmond, WA) software. Data are expressed as mean ± standard deviation (SD) and 95% confidence interval (CI) are also given when essential. The association between variables was assessed with Student's *t*-test; Fisher's exact, χ^2 test and Mann Whitney U-test. *p* values less than 0.05 were considered statistically significant.

Results

Among the two hundred patients (77 males, 123 females) enrolled in

the study, 66 patients had gynecological operations (vaginal cyst removal, IUD removal, and cervical polyp excision), 67 orthopedic (bone biopsy, pin removal, removal of bone exostosis, and treatment of carpal tunnel syndrome), and 67 general surgical operations (inguinal herniorrhaphy, breast mass biopsy, epigastric hernia repair, lateral sphincterectomy and hemorrhoidectomy).

Demographic characteristics, type of operation, and duration of operation are shown in Table 1. There was no significant difference between the two groups in demographic characteristics (age, weight and sex), type of operation, or ASA classification. Additionally, there was no significant difference between them in the amount of anesthesia given and the duration of anesthesia. Total amount of fluid infused in group A (High dose fluid therapy) was 1197 ± 25 ml and in group B (low dose fluid therapy) 171 ± 22 ml.

Table 1
Demographic characteristics, type of operation, and duration of operation of the 200 patients.

	Group A	Group B	<i>p</i> value
	High dose fluid therapy (n = 100)	Low dose fluid therapy (n = 100)	
Age (years)	34.58 ± 12	34.8 ± 11.1	NS
Weight (kg)	57.52 ± 7.9	56.9 ± 8.3	NS
Sex (M/F)	39/61	38/62	NS
Type of operation			
Gynecology operation	33	33	NS
Orthopedic procedures	34	33	NS
General surgery	32	35	NS
Duration of operation (min)	63.55 ± 19	64 ± 18.29	NS
ASA grade I/II	80/20	76/24	NS

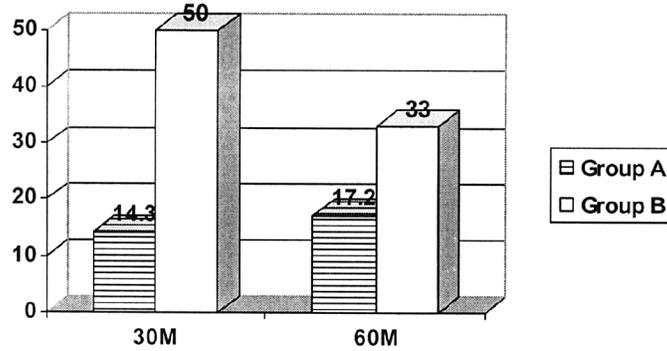
NS: not significant; $p > 0.05$.

The incidence of postoperative thirst significantly decreased at both 30 and 60 minutes postoperative in group A when compared to group B

($p = 0.029$) (Figure 1).

Fig. 1

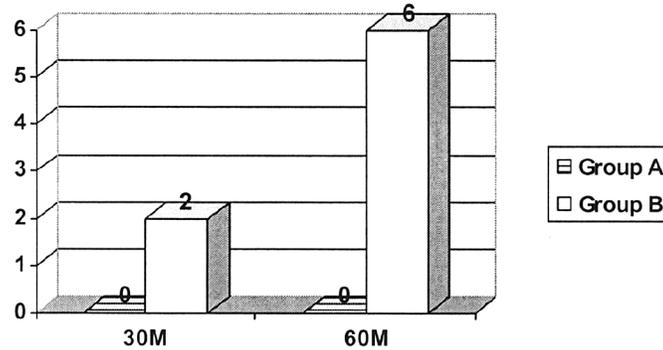
The incidence of postoperative thirst. Group A, High dose fluid therapy; Group B, Low dose fluid therapy; 30M = 30 min postop; 60M = 60 min postop; $p < 0.05$ for 30M and 60M for the two groups using χ^2 test.



The incidence of vomiting also was lower at all times; however only in the first 60 minutes it was statistically significant (Figure 2).

Fig. 2

The incidence of postoperative vomiting. Group A, High dose fluid therapy; Group B, Low dose fluid therapy; 30M = 30 min postop; 60M = 60 min postop; $p > 0.05$ for 30M; however for 60M p value not significant; using χ^2 analysis.



The incidence of nausea and dizziness was lower in group A, but the difference was not significant ($p > 0.05$; Figures 3 and 4, respectively). There was no statistically significant difference in the incidence of

adverse effects and the type of operation ($p > 0.05$).

Fig. 3

The incidence of postoperative Nausea. Group A, High dose fluid therapy; Group B, Low dose fluid therapy; 30M = 30 min postop; 60M = 60 min postop p value not significant ($p > 0.05$) for both 30M and 60M for the two groups using χ^2 test.

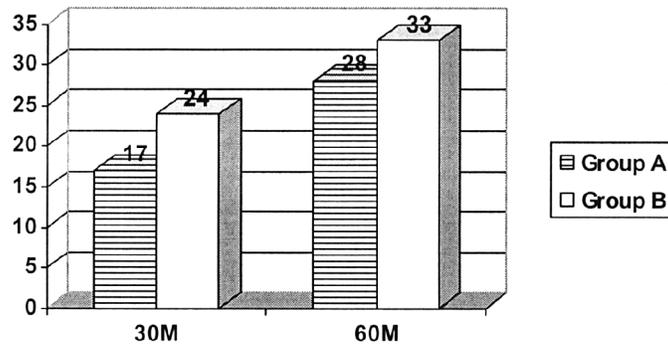
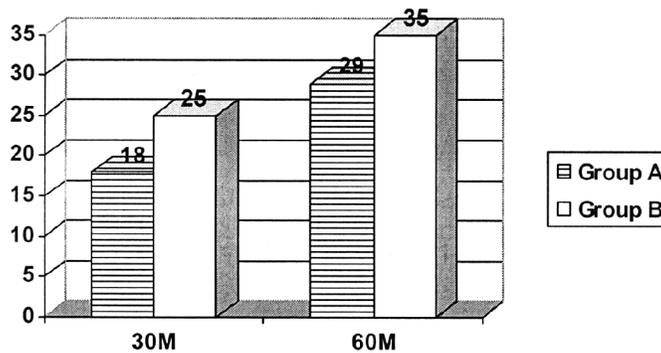


Fig. 4

The incidence of postoperative dizziness. Group A, High dose fluid therapy; Group B, Low dose fluid therapy; 30M = 30 min postop; 60M = 60 min postop p value not significant ($p > 0.05$) for both 30M and 60M for the two groups using χ^2 test.



Discussion

The incidence of postoperative adverse outcomes, such as thirst, nausea, vomiting, and dizziness depends on multiple factors; surgical

procedure, anesthetic technique and the fluid status^{6,8}. Several studies have been done on the prevention of nausea and vomiting and different regimens have been suggested^{2,4-11}. However, only limited work had been done to determine the correlation between preoperative fluid therapy and the well being of patients in the postoperative period. Cook *et al.* reported decrease in the incidence of postoperative adverse effects with fluid administration, especially when sugar was added to the regimen⁶. However the study was not double-blinded. In a prospective double-blinded randomized study done by Yogendran *et al*, high-infusion fluid therapy was compared with low-infusion⁸. They demonstrated that the incidence of adverse outcomes, such as thirst, dizziness and drowsiness, was significantly lower in the high-infusion than in the low-infusion group at 30 min and 60 min after surgery, at discharge and on the first postop. day⁸. Our prospective double-blinded randomized study also demonstrated that high dose preoperative fluid therapy (20 ml/kg) could significantly decrease the incidence of thirst and vomiting at 30 and 60 minutes postop.

Postoperative adverse effects are potentially dangerous and disturbing for patients. They delay early discharge, home readiness and increase the workload of the nursing staff. Hydration was advantageous in reducing the incidence of adverse postoperative effects and therefore, achieving a higher rate of patients' satisfaction.

Different intraoperative fluid therapy regimens have been suggested. These different methods have been proposed depending on the type of surgery. Most studies have suggested administering fluid in order to obtain a urine output of 1 ml/kg/hour¹². However, there has been no standardized fluid regimen therapy for patients scheduled for ambulatory surgery.

Yogendran *et al* had suggested 20 ml/kg based on the daily water requirement of approximately 30 ml/kg per day⁸ confirming our finding that this amount of hydration had significant effects in decreasing postoperative side effects. This amount of hydration was especially useful in our patients, as in our setting, ambulatory surgeries are mostly done in the afternoon and elective operation are done in the morning. Therefore,

our patients had been fasting for more than 12 hours (from 12 midnight until 1 PM of the next day) and so patients were in a dehydrated condition.

Our study reveals that alleviating dehydration with adequate fluid therapy reduced the incidence of postop. thirst and vomiting, within the first 60 minutes. It is therefore concluded that preoperative hydration (20 ml/kg) for patients who are undergoing general anesthesia in short ambulatory surgery, is recommended.

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