Comparative study on the effect of oral consumption of isotonic and water fluids on thirst, nausea and vomiting in patients undergoing coronary artery bypass surgery in the ICU unit of Cardiac Surgery of Kowsar Hospital in Semnan city

Khadijeh Nasiriani (1)
Kamran Ghods (2)
Malihe Ghazvini (3)

(1) PhD of Nursing, Shahid Sadoughi University of Medical Sciences and Health Services, Yazd, Iran
(2) Cardiologist Surgeon, Semnan University of Medical Sciences and Health Services, Semnan, Iran
(3) MSc of Critical Care Nursing, Shahid Sadoughi University of Medical Sciences and Health Services, Yazd, Iran

Corresponding Author:
Malihe Ghazvini
MSC of critical care nursing, Semnan University of Medical Sciences and Health Services, Semnan, Iran
Email: malihe_ghazvini@yahoo.com

Abstract

Introduction: Thirst is one of the complications of cardiac surgery, an unpleasant experience and one of the causes of strong stress and anxiety in the first 24 hours after surgery. Thirst tolerance is very difficult for patients. The purpose of this study was to determine the effect of effective fluids on thirst, nausea and vomiting in patients undergoing coronary artery bypass graft surgery in patients admitted to the ICU of Cardiac surgery.

Method: This is a clinical trial in which 78 patients were examined in two groups of experiment and control. The experimental group was allowed to use isotonic fluids and the control group was allowed to use water after 1 hour after extubation up to 8 hours later. The data collection form included demographic and clinical data and the clinical score of thirst, nausea and vomiting. Data analysis was done using software (SPSS-23), descriptive statistical test, and repeated measures analysis of variance.

Results: According to the results, there was no significant difference in the two groups (experiment and control) in terms of thirst in 8 hours after extubation ($p < 0.96$). Also, the severity of nausea was not significantly different between the two groups at any time after surgery ($p < 0.94$). The P value for the two-domain Fisher test was 1 ($p < 0.9999$) and the P value for the Chi-square Pearson test was close to one ($p = 0.94$), so the presence and absence of vomiting in the patients in the two groups in 8 hours after extubation had no significant difference.

Conclusion: By comparing the results, it is indicated that, in order to reduce the intensity of thirst, the severity of nausea and the reduction of vomiting after coronary artery bypass grafting, isotonic fluid is not different from water and it is necessary to find more effective oral liquids with fewer side effects, and that the current research is done with a higher sample number and with different fluids.

Key words isotonic fluid, isotonic dehydration, nausea, vomiting, thirst

Please cite this article as: Khadijeh Nasiriani, Kamran Ghods, Malihe Ghazvini. Comparative study on the effect of oral consumption of isotonic and water fluids on thirst, nausea and vomiting in patients undergoing coronary artery bypass surgery in the ICU unit of Cardiac Surgery of Kowsar Hospital in Semnan city.World Family Medicine. 2017; (10):80-85.DOI: 10.5742/MEWFM.2017.93143

Introduction

Cardiovascular disease is one of the most important causes of mortality in men and women around the world. Each year in Iran, 45% of all deaths are attributed to this disease (1) and it is the first cause of Iranian deaths (2). Open cardiac surgery is a common interventional treatment in this disease, and about 35 to 50 thousand cases of cardiac surgery are performed every year in Iran (3-4).

Patients undergoing coronary artery bypass graft surgery often have unstable hemodynamic status after being separated from the cardio-pulmonary pump. Failure to provide sufficient volume and fluids to the body can lead to systemic hypo-perfusion, tissue hypoxia and acidosis. On the other hand, patients undergoing endothelial circulation develop systemic inflammatory responses from the pump and cause endothelial damage, which, by increasing vascular permeability, leads to the interstitial edema of various tissues of the body and decreases blood volume. Therefore, proper and accurate replacement of intravascular volume in these patients needs special attention. Different views exist in determining the type of alternative solution, and researchers have cited various crystalloid and colloidal solutions in their papers. But there is always the question as to which solution is ideal. When using these solutions, not only their effects on hemodynamic status are considered, but also the side effects, inflammatory response, effects on vascular endothelial integration, and the effect on the function of various organs of the body, especially the kidneys, as well as effects on the electrolytes, osmolarity, acidity, and the coagulation status of the blood are important (5 and 20-22).

Thirst is one of the complications of cardiac surgery and an unpleasant experience after it and it is considered as one of the causes of strong stress and anxiety in the first 24 hours after surgery [8]. It is very difficult to tolerate thirst for patients so that hearing water and even washing the floor can make it more difficult to tolerate thirst (9). In the early hours of cardiac surgery, the control of fluid volume is precisely determined in order to prevent the increase of fluid in the extracellular space. On the other hand, the patient feels guilty for not complying with the permissible fluid intake (9 and 15).

Thirst is the most elemental sign in isotonic dehydration. And after thirst, a decrease in skin turgor, tachycardia, dry mucous membranes, dull eyes, lack of tears and oliguria appear (9). Clinical symptoms of isotonic dehydration appear when the volume of liquids is reduced to about 5% of body weight. If the deficiency of body fluids exceeds 10%, it can also lead to death due to vascular collapse (10). Correction and treatment of this condition is the compensation of injection or oral fluids (10). The injection of isotonic fluids, such as normal saline or serum ringer, is a fairly good choice to compensate for lost volume in dehydrated patients because sodium is not entered into the intracellular space and the above fluids are distributed only in the intravascular and interstitial tissues of the patient (i.e. the injection serum will remain inside the plasma) (10).

Nausea and vomiting after cardiac surgery are a big problem for patients. Nausea and vomiting can cause aspiration, bleeding, wound closure, water and electrolyte imbalance, delay in recovery, prolonged hospital stay, increased intraocular pressure, increased intracranial pressure, fatigue, anxiety, discomfort, dissatisfaction, caring and increase the cost of hospitalization (11). On the other hand, hydration of the patient, especially in people who have been fasting for a long time, can be effective in reducing nausea and vomiting (13).

In recent years, after general anesthesia and after surgery other than gastrointestinal surgery, oral fluids were forbidden for about 4-6 hours, and this prohibition was to prevent general nausea and vomiting due to general anesthesia and the need for an NPO to be patient for the emergency time (8 and 15). However, studies have shown the benefits and health of consuming oral fluids after general anesthesia, such as quick return to normal diet, faster mobility, faster bowel movement, decreased thirst and increased satisfaction (8 and 15). Generally, from the review of literature, there is little information about the time of ingestion and some studies suggest that in children undergoing minor surgery, water can be consumed 1 hour after anesthesia and oral liquid therapy immediately after the recovery phase of general anesthesia can be harmless in surgery other than gastrointestinal surgery (8 and 15). Also, the incidence of nausea and vomiting in these patients has not been different from that of patients who had been fasting up to 4 hours after anesthesia (6, 18 and 19).

With regard to the above, regarding the time and how to commence the oral liquid after cardiac surgery, there is not enough information available. We studied the effect of isotonic fluids in comparison with controlled and free water in the treatment of thirst and to evaluate the complications of each of them in patients undergoing cardiac surgery, 1 hour after extubation.

Materials and Methods

This is a randomized controlled clinical trial. In this study, there were two groups of experimental (test) and control and the effect of oral consumption of isotonic and water fluids on thirst, nausea and vomiting of patients undergoing coronary artery bypass surgery in patients admitted to the ICU unit of cardiac surgery in Kowsar hospital of Semnan was examined. The sample size was 78. The patients were selected by random sampling and randomly assigned to two groups of test and control group. In the test group, after 1 hour of extubation, patients can drink 100 cc of isotonic fluids for up to 8 hours. In the control group, patients can drink 100 cc of water per hour for up to 8 hours after extubation. These patients with the same conditions (anesthetic drug and duration of the same cardiovascular pump) have undergone cardiac arrest surgery in the Kowsar Medical Center of Semnan.

The data collection tool was a demographic profile including age, sex and type of surgery, and thirst and nausea of the patients based on NRS (Numeric Rating Scale) was examined. The NRS method is used in most studies to measure pain. This tool is also used in several studies to investigate thirst. The patients rate their thirst and nausea on a scale of 0 (without thirst or nausea) up to 10 (maximum value of the experienced thirst or nausea) (17-18). The method of evaluation of thirst in the NRS method was instructed to patients after extubation. The presence or absence of vomiting was objectively investigated by the researcher. The severity of thirst and illness was measured every hour for up to 8 hours after the onset of oral fluid therapy.

Inclusion criteria of the research

• Patients with coronary artery bypass grafts who had been under coronary artery bypass grafting
• In middle age (between 45 and 85 years old) and both genders can be studied
• The patient has provided informed consent to enter the study

Exclusion criteria of the research

• Having nausea and vomiting before taking fluids
• Receiving anti-nausea medicines
• Receiving liquids via NGT

Given that in diabetic patients undergoing surgery, BS was repeatedly checked and with insulin infusion in the first 24 hours, blood glucose was in the normal range, the presence of diabetes did not create a prohibition to enter the study.

The analysis of data was done using the SPSS23 software and based on the following models, statistical tests were used.

• Independent T test was used to "determine and compare the mean of thirst test between two groups of test and control.
• To determine and compare the mean score of nausea severity between two groups of test and control, independent t-test was used.
• To determine and compare the frequency of vomiting between two groups of test and control, Chi-square Pearson test was used.

Findings

In this study, 78 patients were evaluated in two groups of test (39 subjects) and control (39 patients). The total number of samples was 84; 2 of them due to receiving metoclopramide after inoculation, 1 subject due to nursing mistake in the choice of fluid (in the patient who was consuming water, 1 time isotonic fluid was given and the patient subsequently had vomiting) and 2 subjects due to re-transfer to the operating room, were excluded from the intervention.

Table 1: Distribution of patients in two groups based on demographic characteristics

	Group	Water /number (%)	Isotonic fluids / number (%)	p - value
Gender	Male	28 (70%)	32 (84.2%)	0.13
	Female	12 (30%)	6 (15.8%)	
	Total	40 (100%)	38 (100%)	
Age	40-49	5 (12.5%)	4 (10.5%)	0.778
	50-59	14 (35%)	10 (26.5%)	
	60-69	13 (32.5%)	19 (50%)	
	70-9	8 (20%)	5 (13%)	
	Total	40 (100%)	38 (100%)	

As the table shows, 70% of the control group were men and 30% were women. In the test group, 84.2% of the samples were men and 15.8% were women. The two groups have the same gender distribution and have no significant difference (p = 0.13). And the two groups had the same distribution in all age groups (p = 0.778).

In terms of age, in the control group, 12.5% of the samples were 40-49 years old, 35% of the samples were 50-59 years old, 32.5% of the samples were aged 60-69 years old and 20% aged 70-79 years. In the control group, 4% of the samples were age 40-49-, 26.5%, age 50-59, 50% were 60-69, and 13% were 70-79. Chi-Square test was used to assess the consistency of the two groups in terms of sex distribution. The two groups had the same distribution in all age groups (p = 0.778).

Table 2 shows the mean and standard deviation of the thirst intensity in patients in the two groups 8 hours after surgery. Mean and standard deviation of thirst intensity in experimental and control groups immediately after extubation were 8.3 ± 2.2 and 8.1 ± 2.5 with p = 0.69, respectively.
One hour later, 7.2 ± 2.7 and 6.7 ± 2.7 with p = 0.45
Two hours later, 6.7 ± 3.3 and 6.2 ± 3.1, with p=0.46
Three hours later, 5.8 ± 2.7 and 5.1 ± 3.1 with p=0.24
Four hours later, 5 ± 1.3 and 4.8 ± 3.4 with p=0.67
Five hours later, 4.3 ± 3.2 and 4.2 ± 3.7 with p = 0.88

Six hours later, 3.8±3.3 and 3.6± 3.7 with p = 0.86
Seven hours later, 3.4±3.1 and 3.3.± 3.1 with p = 0.81
Eight hours later, 3.1 later3.1 and 3.1 ± 3.7 with p = 0.95

The two groups did not have a significant difference in thirst for each of the 8 periods.

Table 2: The mean and standard deviation of thirst intensity in patients in the two groups 8 hours after surgery

Time (Hour)	Thirst intensity		p - value
	Water Mean ± standard deviation	Isotonic fluids Mean ± standard deviation	
Immediately after extubation	8.1±2.5	8.3±2.2	0.69
1	6.7±3.2	7.2±2.7	0.45
2	6.2±3.1	6.7±3.3	0.46
3	5. ±3.1	5.8±2.7	0.24
4	4.8±3.4	5.1±3	0.67
5	4.2±3.7	4.3±3.2	0.88
6	3.6±3.7	3.8±3.3	0.86
7	3.3±3.1	3.4±3.1	0.81
8	3.1±3.1	3.1±3.7	0.95

Table 3: The mean and standard deviation of severity of nausea in patients in the two groups 8 hours after surgery

Time (Hour)	Nausea intensity		p - value
	Water Mean ± standard deviation	Isotonic fluids Mean ± standard deviation	
Immediately after extubation	0.55±2.2	0.18±1.1	0.36
1	0.33±1.6	0.13±0.8	0.51
2	0.15±0.6	0±0.0	0.16
3	0.10 ±0.6	0±0.0	0.33
4	38±1.7	0.08±0.48	0.31
5	0.10±0.6	0.26±1.6	0.55
6	0.10±0.6	0.34±1.6	0.39
7	0.13±0.79	0.05±0.32	0.60
8	0.38±1.7	0.34±1.6	0.93

Table 3 shows the mean and standard deviation of severity of nausea in patients in the two groups within 8 hours of surgery. Mean and standard deviation of severity of nausea in experimental and control groups immediately after extubation were 0.18 ± 1. 1 and 2.2 ± 0.55 with (p value = 0.36), respectively.

One hour later, 0.13 ± 0.8 and 0.33 ± 1.6 with p = 0.51
Two hours later, 0.6 ± 0.0 and 0.15 ± 0.6, with p=0.16
Three hours later, 0 ± 0.0 and 0.10 ± 0.6 with p=0.33
Four hours later, 0.8 ± 0.48 and 0.38 ± 1.7 with p=0.31
Five hours later, 0.26 ± 1.6 and 0.10 ± 0.6 with p = 0.55
Six hours later, 0.34±1.6 and 0.10 ± 0.6 with p = 0.39
Seven hours later, 0.05±0.32 and 0.13.± 0.79 with p = 0.60
Eight hours later, 0.34±1.6 and 0.38 ± 1.7 with p = 0.93

Based on the above values, it can be concluded that the severity of nausea was not significantly different between the two groups at any time after surgery.

Table 4 Vomiting status in patients in two groups within 8 hours of surgery

Vomiting	Group		p - value	
	2 Isotonic fluids Number (%)	Water Number (%)	Pearson Chi	Fisher
Has	3 (7.5%)	3(7.8%)	0.984	>0.999
Hasn't	35 (92.2%)	37 (92.5%)		
Total	40 (100%)	38 (100%)		

Table 4 shows the vomiting status in patients in the two groups within 8 hours of surgery. The vomiting rate was 7.8% in the experimental group and 7.5% in the control group and lack of vomiting was 92.2% in the control group and 92.5% in the control group. Based on these values, the p values for the two-Range Fisher test was one. There was no significant difference between the two groups (p <0.9999). In addition, the p value for the Chi-square Pearson test was also close to one, which confirms insignificant difference between the two groups (p = 0.94).

Discussion

In a study by Oktay, the first group was allowed to drink regular fluids after transferring the patient to the recovery room. In the second group, until 1 hour after dispensing (discharging) and in the third group up to 2 hours after discharge, the patient remained NPO. There was no significant difference in the frequency of nausea and vomiting in the three groups (16). As it is seen, Oktay's study results are consistent with the current study.

In Yin's study titled 'Early onset of oral fluid intake after general anesthesia', 500 patients received water 4 hours after general anesthesia, and 500 patients consumed 0.5 cc / kg of water after improving in the anesthetic phase. 20 minutes after water intake in the second group, the incidence of vomiting was very low and no significant differences were observed at the same time (p> 0.05) (14). That was consistent with the recent study.

In Radice's study (54 patients in two groups after cardiac surgery) the first group could not drink water, and the second group consumed free fluids after 1 hour of extubation. The information showed that drinking water after 1 hour after extubation without significant increase in the occurrence of nausea, has a positive effect on thirst (15), and that the intensity of thirst was inconsistent with the current study in terms of severity of nausea.

The study of Ramezanian and Najafi in two groups of control (only essential fluid intake) and intervention group (intake of essential fluids plus 10 ml / per 1 kg body weight of Ringer serum) showed that the incidence of nausea and vomiting was significantly lower in the intervention group and moderate fluid therapy reduced the incidence of postoperative nausea and vomiting. Regarding the intake of oral liquids in addition to intravenous fluids in the current study, the reduction in incidence of nausea and vomiting was consistent in both studies (17).

Considering that in similar articles, the incidence of nausea and vomiting after coronary artery bypass surgery was estimated to be 42% - 47% and after general anesthesia was 16% and 36%, it was believed that the incidence of nausea and vomiting was high and the study was effective in this regard. But in the Kowsar Hospital of Semnan, the incidence of nausea and vomiting was very low and about 6%, which was not a valuable subject for research.

Conclusion

In relation to the research hypothesis that "the mean of thirst score in the test group is different with the control group", the results of the t test for thirst did not show a significant difference between the two groups of the test and control during the 8 time periods (p < 0.96). Therefore, the research hypothesis was not accepted (confirmed). Also, in the hypothesis "frequency of nausea in the test group is different with the control group", according to (p <0.94), it can be concluded that the severity of nausea was not significantly different between the two groups at any time after surgery. Therefore, the research hypothesis was not accepted (confirmed).

The third hypothesis states that "the frequency of vomiting in the test group is different to the control group", which is due to the fact that the P value for the two-domain Fisher test was one, thus there was no significant difference between the two groups (p <0.9999). In addition, the P value for the Chi-square Pearson test is also close to one, which confirms the insignificant difference between the two groups (p = 0.94); as a result of this hypothesis is also rejected.

In this study, we concluded that in order to quench the thirst after coronary artery bypass surgery, isotonic fluids have no advantage over water in terms of thirst and reduced fluid intake side-effects, such as nausea and vomiting. And water and isotonic liquids are similar in relieving the severity of thirst and the low degree of complications.

Application of the findings

In order to relieve thirst in various conditions such as post-fasting, after surgery, in long-term thirst, in athletes and people who are forced to remain in the heat for a long time it is always a question of what is the best oral liquid to relieve thirst. The findings of this study showed that there is no difference between water and isotonic fluid in thirst quenching. And in cases where quenching the thirst with edible liquids is very important, the use of water and isotonic fluids is in the same position.

The matters and results obtained in this study suggest that in the absence of water, it is possible to use isotonic fluids such as lemon juice, honey, juice, etc. to relieve thirst. Because of no significant difference in thirst, nausea and vomiting, this study showed that oral isotonic fluids can be a good alternative to water.

Since oral isotonic liquids in terms of quenching thirst and complications such as nausea and vomiting is similar to water, it can help to quench thirst in certain conditions, such as water poisoning.

Study Limitations

The effect of anesthetic drugs can make the patient unable to score a thirst and nausea after extubation. It might also be better to complete thirst-quenching, liquids are given to patients and the time for complete thirst quenching thus achieved. But due to the fact that after 8 hours, the patient's diet became commonplace, it interfered with oral rehydration and thirst-quenching. Therefore, the thirst was measured up to 8 hours after extubation.

Suggestions for next research

Considering that with a sample size of 78 patients, the difference in the intensity of thirst was not significant in experimental and control groups, it is recommended that this study be carried out with a higher number of samples and with numerous isotonic fluids, including lemon juice-honey. Also, due to the low incidence of nausea and vomiting in Semnan Kowsar Hospital, it is recommended to repeat this research in treatment centers with a high rate of nausea and vomiting incidence. In addition, in similar studies, the volume of fluids consumed by the patient before thirst can also be recorded and examined, in order to identify the fluids that can quench thirst with less volume. Also, despite the fact that the NRS chart in some studies has been used to measure thirst, but due to the effects of anesthetic drugs, it is better to use a different method in this regard.

References

1. World Health Organization. NCD Country Profiles, 2011. Available at: www.who.int/. Cited [on line 25 Dec 2012]
2. Nasim Dolfo Analytical -News database 2014.http://nasimedelfan.ir, 2014-
3. Cristiane, F.et al., 2012. Stress factors for patients undergoing cardiac surgery. Invest Educ Enferm.;30(3)
4. Montazer, R. Not. 2012. Necessary surgeries or jobber surgeries [on line]. Available from: URL: http://tebotahdidenarm.blogfa.com/category/16/(persian)
5. Alavi S.M. MD, et al, 2010, Comparison of the Effect of Gelatin Solution, Ringer Solution and Voluven in the Hemodynamic Status of CABG Patients during Transfer to ICU and Early Post Operation. Iranian journal of surgery.2010, 18(3); 38 – 46.
6. http://Emedicin. medscape.com, Dehydration Types: Pathophysiology, Lab Tests and Values by Jan Modric, July 31st 2013. Last reviewed 8th March 2016
7. Sepehri H, Rastegar A, Ghasemi k, 2011, Gyton Medical physiology, twelfth edition
8. Pérez TE, et al., 2000. Anxiety in the postoperative period following cardiac surgery. Rev Enferm; 23(7-8):494-8.
9. Cristiane F. Lisboa G. Olga M. Eliana O., 2012. Stress factors for patients undergoing cardiac surgery, ;30(3): 312-319
10. www.who.int/child-adolescent-health/New_Publications/CHILD_HEALTH/Meded/2med.htmUnit 2 - Pathophysiology of Watery Diarrhoea: Dehydration and Rehydration Medical Education: Teaching Medical Students about Diarrhoeal Diseases
11. Sawatzky JA1, et al, 2014. Post-operative nausea and vomiting in the cardiac surgery population: who is at risk. HeartLung. Nov-Dec; 43(6):550-4. 2014.07.002
12. Ford, et al, 2015. Early Initiation of Oral Intake in Adult Patients After Cardiothoracic Surgery is Safe and Reduces Thirst 2015 by American Heart Association
13. TahoeDoc, 2016. Common Anesthesia Side Effects: What to Expect, http://hubpages.com/education/Common-Anesthesia-Side-Effects, Updated on April 25, 2016.
14. Xiaorong Yin, Ling Ye, Liang Zho, Lish Li, Jinping Song, 2014. early versus delayed postoperative oral hydration after general anesthesia ;7(10):3491-3496
15. Radicec, Stella F, Salvini L., 2012. Does free assumption of water from one hour after extubation reduce thirst without increasing complications in heart surgery patient, Apr-Jun;64(2):69-74
16. Yunus O A, et al, 2016, Determining a Safe Time for Oral Intake Following Pediatric Sedation; 43 (1): 57-61
17. Ramezanian N, Najafi Anaraki A, 2012, Effects of fluid therapy on the incidence of postoperative nausea and vomiting after surgery, National Congress of Paramedicine and Health, Yasuj University of Medical Sciences, May 18-21, 2011
18. Yang L.Y., Yates P., Chin C.C., Kao T.K. Effect of acupressure on thirst in hemodialysis patients .Kidney and Blood Pressure Research.2010:33 (4): 260–265.
19. Belgüzar K. Validity and Reliability of the Turkish Version of the Thirst Distress Scale in Patients on Hemodialysis. Asian Nursing Research .2013; 7(4):212-218.
20. Cardiac surgery Essential for critical care Nursing; Sonya R. Hardin, Roberta Kaplow- 2010
21. Cardiac surgery in the adult fifth edition; Lawrence H. Cohn, MD, David H, Adams- 2017
22. Essential cardiology: principles and practice Clive Rosendorff- 2013