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The effectiveness of pre-warm intravenous fluids on prevention of intraoperative hypothermia in surgical patients

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Abstract

Background: Hypothermia is one of the problems occurring during surgery, which can happen due to thermoregulation mechanism disorders and intake of low temperature IV fluids, and may cause increase in blood pressure, heart rate, intracranial pressure, oxygen consumption, pain, and discomfort to the patient. The rate of surgery in our country is higher than the global standard. As one of the responsibilities of the nurse is patient's advocacy, should support them. This study aimed to investigate the effectiveness of pre-warm intravenous fluids on prevention of hypothermia in patient with surgery.
Materials and Methods: Twenty-eight patients undergoing elective surgery by general anesthesia were randomly allocated in two groups of intervention and control. All selected patients in the intervention group received pre-warm serum (37 °C) while those in the control group received serum at room temperature (25.5 °C). The core body temperature and some hemodynamic parameters of the participants were assessed during the operation. Results: The mean of pulse rate, systolic blood pressure, diastolic blood pressure, and arterial Oxygen saturation in the two groups were not statistically significant ($p>0.05$). But the mean of patient's core body temperature at the end of anesthesia in the intervention and control groups were 20±0.5°C and 35.34±0.6 °C, respectively ($p<0.05$).
Conclusion: Infusion of pre-warm serum (37 °C) would prevent intraoperative hypothermia and improve the nursing care for patients who are undergo surgical section.

Keywords: Surgical section, hypothermia, intravenous fluids, nursing care

Introduction

Hypothermia is referred to the reduction of core body temperature to below 36 °C. This phenomenon is one of the postoperative outcomes that can be caused by heat loss due to exposure to cold weather, thermoregulation mechanism disorders and, consequently, vasodilatation and loss of muscle tone as a result of anesthetics or local anesthesia. Core body temperature ranges from 36.5 °C to 37.5 °C. Body temperature reduction and, consequently, chills lead to anenhance in heart rate, and catecholamine release, vasoconstriction, lower circulation, and metabolic acidosis. There are numerous risk factors in relation with development of intraoperative hypothermia, including aging, gender, depth of anesthesia, type of surgery, length of anesthesia, operating room (OR) temperature, patient's low weight, and history of chronic diseases and cool fluids' infusion. Postoperative chills can be unpleasant and distressful, cause complications for the patients, and may lead to worsening of their postoperative pain, such that some patients indicate it as their worst hospitalization experience. Prevalence of postoperative chills has been reported to be about 40%. This rate has been reported as 6.3-66% for the patients receiving general anesthesia and as an average of 56.7%, ranging from 40% to 60%, for the patients receiving spinal anesthesia. Prevention of hypothermia is an absolute way of preventing the postoperative chills in response to hyperthermia. Intraoperative hypothermia can be reduced by the methods which reduce skin heat emission to the environment because of a cold OR, surgery incision evaporation, and by prevention of intravenous infusion of cold fluids.

Other non-medical methods employed in various studies include warming and humidifying the air way, warming the skin through warm covers, application of patient warming system through water circulation and forced air warming system, and infusion of warm fluids. Among the above-mentioned strategies to prevent hypothermia, warming intravenous fluids to preserve patient's body temperature in the OR can be conveniently applied, as intravenous warm fluids are available in all ORs in Iran. One of the surgeries performed at a high rate is cesarean section (CS). Exposure of these patients to anesthesia for CS leads to more temperature reduction because of the effect of anesthetics on vascular and body thermoregulation mechanisms, abdominal vast incisions, and wetting surgical covers with blood and amniotic fluid. Various studies reported controversial results in relation to application of non-medical methods in the prevention of hypothermia among the mothers undergoing CS. Chung et al. (2012) [7] in their study on the effect of warming of patients and infusion of pre-warmed fluids in CS on the prevention of hypothermia and postoperative chills showed that core temperature was higher in the study groups (infusion of warm fluids and forced air warming system) compared to the control group ($P = 0.004$). Incidence of chills was also lower in the study groups compared to the control group ($P = 0.035$). They concluded that forced air warming system and infusion of pre-warmed intravenous fluids prevented patients' postoperative chills. As patients' support is one of the main duties of nurses, anesthesia nurses are responsible for this important issue. It is essential to find preventive strategies for intraoperative hypothermia in patients undergoing surgery section. Therefore, this study aimed to apply an appropriate, cost-effective, complication-free and available method of warming intravenous fluids to prevent hypothermia during surgical section.

Materials and Methods

This quasi-experimental study was conducted on 28 patients selected as candidates for elective surgical section under general anesthesia at People's Hospital in Bhopal from January to March 2020. The subjects were selected through purposive sampling, and the selection was based on the inclusion criteria. From 40 patients who assessed for eligibility, 12 patients excluded because of not meeting inclusion criteria. Firstly, the goal and method of study were explained to the eligible subjects and written consents were obtained from them for ethical considerations. The inclusion criteria were: Undergoing surgery with general anesthesia; having a tracheal tube; surgery length less than 1 h; not receiving corticosteroids, non-steroidal sedatives, Mg sulfate, or anti-hypertension drugs; and lack of endocrine disorders, vascular diseases, pregnancy hypertension, fever, amniotic bag rupture, polyhydramnios, and oligohydramnios. The exclusion criteria were: Having received intraoperative blood transfusion, surgery length more than 1 h, receiving medications other than conventional medication, intraoperative hypotension due to any reason leading to infusion of more fluid than calculated, or therapeutic program changes. The candidate patients for surgical section received infusion of warm Ringer's lactate at 37 °C.

After they were monitored and administered primary fluids, the subjects underwent pre-operative care. After preoxygenation, anesthesia was induced by administering. After surgery, the effect of relaxants was neutralized by administering atropine (0.02 mg/kg). Data collection tool contained a questionnaire to record patients' demographic information, a checklist for recording medications during anesthesia, and a checklist of the recorded intraoperative parameters. Validity of the information recording form was confirmed by content

validity through references and guides of university professors. Reliability of the measurement tools was obtained by careful measurement and confirmation of their calibration and sensitivity. The devices were calibrated, while their specificity and sensitivity had been determined by the manufacturing company and the medical technologist engineer in the related hospital. The research co-workers filling the forms of data record and the subjects were blinded to the study to increase the validity of the data. After the data were collected, they were analyzed by t-test, Chi-square test, and analysis of variance (ANOVA) with repeated measurements through SPSS version 16. Significance level was considered as $p<0.05$.

Research limitations

♣ Lower-volume pre-warm serum bags (500 ml), which could be infused more quickly, were used to prevent temperature loss in the OR.

♣ Precise determination of bleeding volume is difficult in surgeries, and this issue is even more difficult in Surgical Section. To decrease this effect, the amount of bleeding was estimated by using counting and weighing surgical gauzes and long gauzes.

Result

Variables of age, weight, time interval between arrival to OR and beginning of anesthesia, lengths of surgery, temperature and humidity of OR, patients' core temperature in the first minutes of their arrival to OR, and the amount of patients' fluid intake in the two groups of study and control were analyzed by statistical tests and showed no significant difference. Chi-square test showed no significant difference between the cause of CS in the mothers of study and control groups (P = 0.98). Core temperature of the patients was measured in the first minutes of their arrival to OR until the beginning of anesthesia in the two groups at their tympana and showed no significant reduction (P = 0.10), but the measurements taken every 15 min to the end of surgery and anesthesia showed a reduction in both the groups. This reduction was more in the control group, such that at 15 min of surgery, the temperatures were 36.04±0.43 °C and 35.63±0.6 °C in the study and control groups, respectively, which showed a significant difference (P = 0.003). The core temperatures at the 30th min was 35.98±0.5 °C and 35.41±0.6 °C in the study and control groups, respectively, which showed a significant difference (P = 0.001). In addition, the core temperatures of the patients at the end of anesthesia were 36±0.5 °C and 35.34±0.6 °C in the study and control groups, respectively, which showed a significant difference (P = 0.000) Comparison of the core temperatures of patients in the two groups of study and control before and during anesthesia showed a significant difference by repeated-measures ANOVA (P = 0.008).

Table 1: Comparison of core temperatures of the patients in the study and control groups during surgery

Core T Group	On arrival Mean	OR to SD	Beginning Anesthesia Mean	SD	15th Anesthesia Mean	Min of SD	30th Anesthesia Mean	Min of SD	End surgery Mean	SD	Repeated measure ANOVA
Study	36.44	0.33	36.44	0.33	36.04	0.43	35.98	0.49	36	0.5	F=7.844
Control	36.31	0.41	36.15	0,56	35.63	0.60	35.41	0,61	35.34	0,6	DF=1, 42. P=0.008

SD: Standard Deviation, OR: Operating Room

Patients' core temperatures showed no significant difference at the beginning of anesthesia in the two groups (P = 0.10), but the measurements taken at the 15th (P = 0.003) and 30th min of surgery (P = 0.001) and at the end of surgery (P = 0.000) showed a significant difference. It reveals that pre-warmed serum led to higher core temperature in the patients of the study group compared to those of the control group [Table and Figure 1].

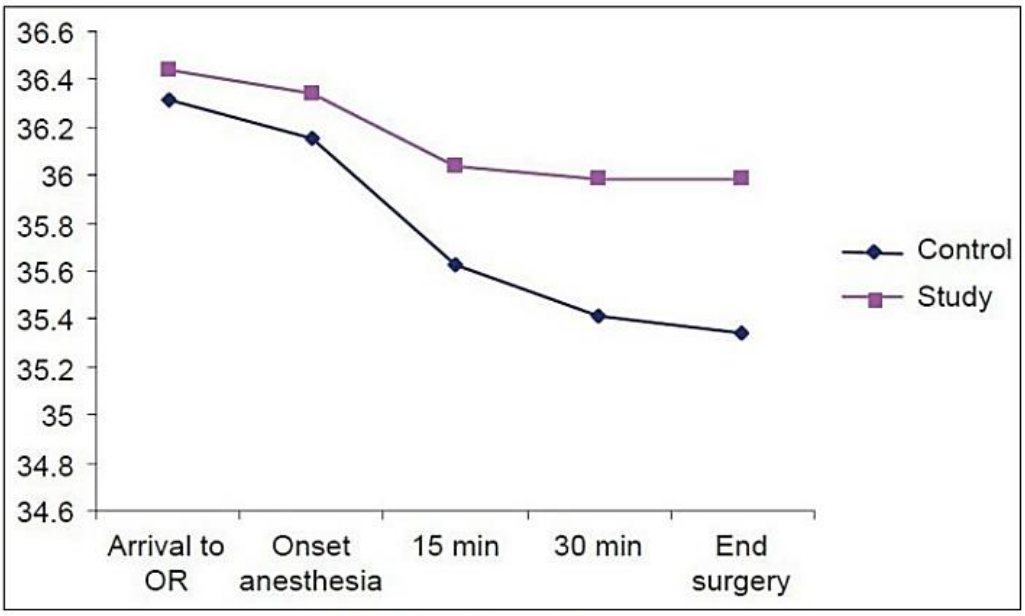

Fig 1: Patients' core temperatures during surgery

Discussion

In our study, the core temperature of patients in the study group (receiving pre-warmed fluid) was 0.5°C higher compared to those in the control group (receiving room temperature fluids). This finding is in line with that of Woolnough (2009) [8] compared the two methods of active fluid warming (warming during surgery) and passive fluid warming (warming before surgery) in women undergoing CS and concluded that warm fluids slowed down the reduction of body temperature and increased mothers' comfort. Finally, this study revealed the efficiency of passive fluid warming and its cost efficacy. Woolnough et al. (2009) [8] showed that the incidence of chills in elective surgical patients receiving warm intravenous fluids and in those receiving room temperature fluids showed no difference. Other studies also showed that warming intravenous fluids could not prevent hypothermia among patients undergoing elective surgery. These results are not consistent with ours, possibly due to low sample size of the above-mentioned study. These differences reveal the necessity of further similar studies. Previous studies showed that even minor hypothermia might lead to serious unexpected outcomes in many of the patients, including surgery incision infection, prolonged hospitalization, increased bleeding during surgery, more demand for blood transfusion, postoperative ventricular tachycardia, postoperative chills, and prolonged recovery period, as the main complications that result from hypothermia in human beings. Numerous methods have been studied to prevent hypothermia among the patient's undergoing surgery. The most important methods are infusion of warmed intravenous fluids and application of forced air warming system. Each liter of low-temperature infused fluid can diminish the body temperature of a person by 0.25 °C. Infused warmed intravenous fluids can enhance the core temperature by 0.5 °C -0.7 °C and reduce the risk of hypothermia. To keep the patient warm before and during surgery, the two main methods of forced air warming system and infusion of warm intravenous fluids are used to maintain the patient's core temperature during surgery. The main advantages of body temperature preservation in normal range include low risks of incision infection, coagulation disorders, and myocardial ischemia.

Conclusion

Based on the obtained results, it can be concluded that application of the convenient, easy, and low-cost method of warming intravenous fluids (Ringer's serum) can be helpful in prevention of hypothermia resulting from general anesthesia among patients undergoing surgery and its potential hazardous complications (prolonged hospitalization, increased bleeding during surgery, more demand for blood transfusion, postoperative ventricular tachycardia, postoperative chills, prolonged recovery period, infection, and myocardial ischemia during surgery). Therefore, Nurses as patients advocate should prevent the incidence of patients' complications in OP through precisely checking the vital signs, especially temperature, and by undertaking other preventive interventions such as infusion of warm intravenous fluids.

Conflict of Interest Not available

Financial Support Not available

Reference

1. Kiakkas P, Poulopoulou M, Papahatzi A, Souleles P. Effect of hypothermia and shivering on standard PACU monitoring of patients. AANA J. 2005;73:47–53.
2. Miller RD, Eriksson LI, Fleisher LA, Wiener-Kronish JP, Young WL. 7 th Ed. New York: Churchill Livingstone. Miller's Anesthesia; c2010.
3. Sessler DI, Kurz A. Mild perioperative hypothermia. Anesthesiology News Special Edition; c2007. p. 61-72.
4. Hosein Khan Z, Behzadi M. Morphine, Pethidine and Fentanyl in postoperative shivering control: A randomized clinical trial. Tehran Univ Med J. 2007;64:57-63.
5. Movassaghi Gh R, Palideh H. Comparison between ant shivering effects of Meperidine and Methadone. Razi J Med Sci. 2002;9:107-10.
6. Hasankhani H, Mohhammadi E, Naghizade MM, Moazzami F, Mokhtari M. The effect of warming intravenouse fluid on perioperative hemodynamic status, postoperative shivering and recovery in orthopedic surgery. Shiraz E-Med J; c2004. p. 5.
7. Han G, Zhang S, Li X, Widjojo N, Chung TS. Thin film composite forward osmosis membranes based on polydopamine modified polysulfone substrates with enhancements in both water flux and salt rejection. Chemical Engineering Science. 2012 Oct 1;80:219-31.
8. Woolnough AD. Fear of crime on campus: Gender differences in use of self-protective behaviours at an urban university. Security Journal. 2009 Feb 1;22:40- 55.