Hypothermia Frequency of Patients in the Postoperative Period

Munire Babayigit[1], Zehra Baykal Tutal[1], Handan Gulec[2], Necla Dereli[1], Seda İlhan[1], Mustafa Alparslan Babayigit[3], Eyup Horasanlı[2]

[1] Departmant of Anesthesiology and Reanimation, Kecioren Training and Research Hospital, Ankara, Turkey

[2] Departmant of Anesthesiology and Reanimation, Faculty of Medicine, Yıldırım Beyazıt University, Ankara, Turkey

[3] Department of Public Health, Gulhane Military Medical Academy, Ankara, Turkey

Abstract

In this study, we aimed to investigate the frequency of postoperative hypothermia in our hospital.In Keçiören Training and Research Hospital, 165 ASA I-III patients between the ages of 18 and 81, whose operation times were longer than 30 minutes were included in this study. In addition to recording the demographic data of the patients, the body temperatures were also measured twice in the preoperative preparation room and in the postoperative care unit in the forehead with infrared thermometers. The operation types, the durations, the anesthesia types, and the patients' heating status in the perioperative period were recorded. If the body temperature was 35oC or below, it was accepted as hypothermia; and if it was 34^{o}C and below, it was accepted as deep hypothermia. We compared the data of normothermic, hypothermic and deep hypothermic patients. 79 women (47.9%) and 86 men (52.1%), totally 165 patients were included in this study. It was detected that 7 patients (4.2%) were heated preoperatively. It was determined that 16 patients (9.7%) were hypothermic in the postoperative period, and 3 of them were deep hypothermic. There were no statistically meaningful differences between the hypothermic and non-hypothermic patients in terms of age, gender, ASA, type of anesthesia, and operation time (p>0.05). Although postoperative hypothermia has not been found as a common problem in our operating theaters, we observed that most of the postoperative hypothermia cases were in percutaneous urological operations. In order to reduce the frequency of postoperative hypothermia, specific precautions for this type of operations should be taken.

Keywords: Postoperative, hypothermia, heat

(Rec.Date: Aug 25, 2015 Accept Date: Sept 13, 2015)

Corresponding Author: Munire Babayigit, Kecioren Training and Research Hospital, Ankara, Turkey
E-mail: mnroksuz@hotmail.com

Introduction

Perioperative hypothermia is described as the body temperature falling below 35°C or 36°C 1 hour before the anesthesia until 24th hour after the anesthesia [1]. Hypothermia is observed with the 50-90% frequency in the perioperative period [2]. Patients over ASA III and over, the elderly, newborns and the patients who have comorbidity and whose operation duration exceeds half an hour are under the risk of hypothermia. The characteristics of the operation, the temperature of the operation room, the duration of the mechanic ventilation, the temperature of the intravenous infusion liquids and blood products are the factors that define the perioperative hypothermia development [3,4].

Important complications may appear in patients who are in the higher risk group. Delayed emergence from general anesthesia, extension of the duration of the anesthetics agents, coagulopathy, depression of the respiratory and cardiovascular system, increase in the surgical wound infections and postoperative shivering are among these complications [3-6]. Due to the above mentioned reasons, hypothermia development is an important problem increasing morbidity and mortality.

We aimed to examine the factors that increased the frequency and development of hypothermia after the operations in Keciören Training and Research Hospital.

Materials and Methods

The Ethical approval was received from the Local Ethics Board of the Kecioren Training and Research Hospital. The patients in our hospital who had operational duration more than half an hour, ASA I-III, and who were over the age of 18 were included in the study. The patients who were ASA IV, V and who were in sepsis were excluded from the study.

The body temperatures of the patients were measured and recorded in the preoperative period in the waiting room. In order to determine the hypothermia frequency that developed during the routine practices in our surgery room, an observer anesthesia doctor recorded the data

without informing the anesthesia team. The operation types, durations and the other relevant data -like whether the patients were heated in the perioperative period or not- were recorded from the anesthesia form when the patients arrived at the recovery room after the operation. The body temperatures were recorded by the same anesthetist when the patients arrived at the recovery room. The temperatures were recorded with infrared thermometers without contact to the skin (VisioFocus 06400, Digital Non-Contact Thermometer, Italy). The measurements were made not from the tympanic membrane, but from the skin in order not to disturb the patient, and the values below 35oC were accepted as deep hypothermia. Informed consents were received from the patients before the application.

Statistical Analysis

The frequency distributions, average and standard deviation values were used in evaluating the data. In the analyses of the data between the hypothermic and normothermic patients, the comparison of the data whose intra-group distributions were in accordance with the normal distribution were made with the T-Test; and those that were not in accordance were made with the Mann Whitney U Test. The comparisons among the discrete variables were analyzed with the Chi-Square Test. In the analyses of the data, the SPSS Statistical Program, Version 15.0 was used. The statistical significance value was accepted as $p<0,05$.

Results

79 (47,9%) of the 165 patients, who were between the ages 18 and 81 (age±sd: 41,2±18,3) were women, and 86 (52,1%) were men. 69,7% of the patients received general anesthesia, 26,7% of them received neuroaxial anesthesia, 3,6% of them received peripheral neural block. It was determined that the average operation duration was 74,7± 39,2 minutes, and 7 patients (4,2%) were perioperatively heated. In none of the patients was hypothermia detected in the preoperative period. On the other hand, it was detected postoperatively that 16 patients (9,7 %) were hypothermic, and 3 of them were deep hypothermic.

The patients were separated into two groups as normothermic and hypothermic [the normothermic group (n: 149) and the hypothermic group (n: 16)]. The age, gender and ASA classifications were similar between the two groups (Table 1).

The applied surgery and anesthesia types were similar in two groups (p: 0,089 and p:0,367, respectively). No statistically meaningful differences were determined between the two groups in terms of average operation durations (p: 0,243, Table 2).

None of the patients were heated in the hypothermic group, and 7 patients were heated in the normothermic group.

When the postoperative heat values are considered, it has been observed that the average value of the normothermic group was 36,1±0,4; and the average value of the hypothermic group was 34,5±0,5. The difference between has been considered as being statistically significant (p: <0,001, Table 2).

When the patients are considered in terms of surgical branches, it was observed that 8 of the hypothermic patients (50%) were the cases of the urology clinic; and 7 of them (43,7%) had percutaneous nephrolithotomy operation (Table 3).

The temperature in our operating theaters is adjusted to 23oC with laminar current in a central system. The temperatures of the operating theaters were detected as being 22,8oC in both groups (p: 0,604).

Table 1. Socio-demographic characteristics

	Normothermic Group (BT >35 ^{0} C, n=149)	Hypothermic Group (BT≤35 ^{0} , n=16)	*p*
Gender (F/M)	74/75	5/11	,194**
Age	40,94 ± 18,4	43,81± 17,7	,553*
ASA (I/II/III)	60/ 80/ 9	5/ 10/ 1	,777**

ASA: American Society of Anesthesiologists
BT: Body Temperature
* T-Test
** Chi-square test

Table 2. Distribution of data

	Normothermic Group (n=149)	Hypothermic Group (n=16)	*p*
Room Temperature (^{0} C)	22,8 ± 0,3	22,8 ± 0,4	,604*
Surgical Type			
Head- Neck	37	0	,089**
Open Abdominal Surgery	26	4	
Laparoscopic	52	10	
Extremity	17	1	
Superficial Minor Surgery	17	1	
Anesthesia Type			
General Anesthesia	102	13	,367**
Neuraxial Anesthesia	42	2	
Peripheral Nerve Block	5	1	
Peroperative Heating (Yes/ No)	7/142	0/16	,376**
Operation Time (min)	74,1±40,1	79,9±29,8	,243*
Postoperative Body Temperature (^{0}C)	36,1±0,4	34,5±0,5	<0,001*
* Mann Whitney U Test ** Chi-square Test			

Table 3. Distribution of the department of surgery

	Normothermic Group		Hypothermic Group		Total	
	n	%	n	%	n	%
General Surgery	55	36,9	4	25,8	59	35,8
Orthopedics and Traumatology	13	8,7	0	0,0	13	7,9
Urology	33	22,1	8	50,0	41	24,8
Obstetrics and Gynecology	9	6,0	2	12,5	11	6,7
Ear, Nose and Throat	29	19,5	0	0,0	29	17,6
Plastic Surgery	7	4,7	2	12,5	9	5,5
Cardiovascular Surgery	3	2,0	0	0,0	3	1,8
Total	149	100.0	16	100.0	155	100.0

Discussion

Hypothermia, which is observed in the postoperative period as an important cause of morbidity and mortality, is a frequent but preventable problem. The risk factors for hypothermia have been determined in various studies. The major factors are the patient's being over the age of 70, ASA III or IV; longer operational durations, thorax or stomach surgery, intraoperative blood loss and liquid replacement being excessive, the temperature of the operating theater being below 23oC, and the patient's being hypothermic in the preoperative period [3,5-8]. It is necessary that patients are brought to the operating theatre 20 minutes before the operation. However, this waiting duration being longer, especially in conditions where the proper temperature is not obtained, increases the risk of hypothermia [9].

Hypothermia was not detected in any of our patients in the preoperative period. In the postoperative period, in 7,9% of the patients (13/165) hypothermia was detected; and deep hypothermia was detected in 1,8% (3/165) of them. In similar studies, it was reported that postoperative hypothermia was observed at much higher temperatures [10-12].

In a study conducted by Abelha et al., the postoperative hypothermia incidence was investigated in 185 patients who had non-cardiac surgery, and the temperature below 35oC was accepted as hypothermia. Postoperative hypothermia with a 57.8% (n=107) frequency was detected in this study. It was reported that 43.8% of the patients (n=81) were heated perioperatively. Hypothermia was observed in 55 of the heated patients [11]. It has been observed in our study that 7 patients received perioperative heating and none of them had postoperative hypothermia.

In a study conducted by Aksu et al., the postoperative hypothermia incidence was examined in 564 patients between the ages 1 month and 84. The patients with heart surgery and the newborns were excluded from the study. The hypothermia frequency was detected as 45.7%. In our study, the patients with heart surgery and the newborns were excluded too, and the frequency was investigated. It was detected that postoperative hypothermia developed in 9.7% patients.

In a study conducted by Tramontini et al., 81 elderly patients were included and 59.3% postoperative hypothermia was detected. When compared with these studies, it has been determined that postoperative hypothermia was detected at much lower temperatures in our operating theater.

The reason for the hypothermia frequency being lower in our operating theater is that the patients wait in the preoperative period in the waiting rooms that are heated with infrared heaters and thus they are protected from hypothermia. When the operation types are considered, it is claimed that the reasons for this is the fact that the thorax surgery and cardiovascular surgeries -in which postoperative hypothermia is observed more- are not performed in our operating theater, and the number of intra-abdominal oncological surgeries, which last longer, are relatively lower.

One of the important factors, which are influential in hypothermia development, is the temperature of the operation room. The temperature being lower than 23oC leads to the hypothermia development. The laminar current of the operation room may be turned off in especially pediatric patients with hypothermia risk. The American Anesthesiology Association (ASA) recommends temperature monitorization for the risky patients. The general application in our clinic is like this. However, the perioperative temperature monitoring has not been recorded in our study. This is a deficiency of our study. However, it has been observed that 7 patients (4.2%) were heated in the perioperative period.

Hypothermia can be prevented by informing the patients about their clothing and asking for additional blankets, and by following and adjusting the temperature values of the patient rooms (when necessary), waiting rooms and operation rooms [6, 13]. Systems which blow hot air, electric blankets, radiant heaters, intravenous liquid and blood product heaters, filters that change the temperature values, and heating techniques with negative pressure may be used to heat the patients [14]. General methods that will increase the room temperature in our operating theater are not accepted due to some reasons such as; these methods may decrease the working performance of the surgery team, pollute the room with the perspiration of the surgery team, and due to the possibility of leading to infection. For these reasons, heating systems which blow hot air are used for the patients who are in the risk group and who are proper for the application in the perioperative and postoperative period.

We use the same recovery room for the preoperative and postoperative periods. The room is heated with infrared heaters and the patients are covered with thick blankets and thus hypothermia is prevented. Our patients are heated with heaters which blow hot air if postoperative hypothermia is detected.

The majority of the patients with hypothermia (43.7%) had percutaneous nephrolithotomy operations. We consider that the washing solutions in these operations having been used in excessive amounts and therefore the sterile cloth covering the patients becoming wet lead to the loss of the heat in the patient. Since the heaters which blow hot air cannot be used effectively in these cases, it has been planned that intravenous heating system would be purchased for these types of operations.

One of the risk factors for the postoperative hypothermia is too much replacement of liquid, blood and blood products. These replacements having not been recorded may be considered as the missing point of our study.

Conclusion

Although postoperative hypothermia is not a frequent problem in our operating theater, specific protective measures for the operation types in which hypothermia is observed must be taken into consideration and the planning must be made in the light of these considerations.

References

1. Turkish Society of Anesthesiology and Reanimation, Prevention of Unintended Perioperative Hypothermia Guide. Turk J Anaesth Reanim. 2013;41:188-90.
2. Frank SM, Tran KM, Fleisher LA, Elrahmany HK. Clinical importance of body temperature in the surgical patient. J Thermal Biol. 2000;25:151-5.
3. De Mattia AL, Barbosa MH, De Mattia Rocha A, Farias HL, Santos CA, Santos DM. Hypothermia in patients during the perioperative period. Rev Esc Enferm. 2012;46(1):60-6.
4. Sessler DI. Perioperative heat balance. Anesthesiology. 2000;92(2):578-96.
5. Putzu M, Casati A, Berti M, Pagliarini G, Fanelli G. Clinical complications, monitoring and management of perioperative mild hypothermia: anesthesiological features. Acta Biomed. 2007;78(3):163-9.
6. Hart SR, Bordes B, Hart J, Corsino D, Harmon D. Unintended perioperative hypothermia. Ochsner J. 2011;11(3):259-70.
7. Kempainen RR, Brunette DD. The Evaluation and management of accidental Hypothermia. Respir Care. 2004;49(2):192-205.
8. Luís C, Moreno C, Silva A, Páscoa R, Abelha F. Inadvertent postoperative hypothermia at post-anesthesia care unit: incidence, predictors and outcome. O J Anes. 2012;2:205-13.
9. Harper CM, Andrzejowski JC, Alexander R. NICE and warm. Br J Anaesth. 2008;101:293-5.
10. Aksu C, Kuş A, Gürkan Y, Solak M, Toker K. Survey on postoperative hypothermia incidence in operating theatres of Kocaeli University. Turk J Anaesth Reanim. 2014;42:66-70.

11. Abelha FJ, Castro MA, Neves AM, Landeiro NM , Santos CC. Hypothermia in a surgical intensive care unit. BMC Anesthesiol. 2005;5:7.
12. Tramontini CC, Graziano KU.Hypothermia control in elderly surgical patients in the intraoperative period: evaluation of two nursing interventions. Rev Lat Am Enfermagem. 2007;15(4):626-31.
13. NICE. Perioperative hypothermia (inadvertent): the management of inadvertent perioperative hypothermia in adults. NICE Clinical Guideline 29. London: National Institute for Health and Clinical Excellence, 2008. www.nice.org.uk/CG065 access date: 07.08.2014
14. Hooper VD, Chard R, Clifford T, Fetzer S, Fossum S et all. ASPAN's Evidence-Based Clinical practice guideline for the promotion of perioperative normothermia. J Perianesth Nurs. 2009;24(5):271-87.