JURNAL KEPERAWATAN DAN FISIOTERAPI (JKF)
E-ISSN: 2655-0830
https://ejournal.medistra.ac.id/index.php/JKF

Application of Active and Passive Warming to the Patient with Tongue Reconstruction and Frenuloplasty in PACU at the Central Operation Theatre in Hasanuddin University Hospital: A Case Study

Imelda Olviana Lande'eo[1], Takdir Tahir[2*], Abdul Majid[2], Syahrul Ningrat[3]

[1]*Professional Nurse Program, Faculty of Nursing, Hasanuddin University, Perintis Kemerdekaan Km 10 Tamalanrea, Makassar 90245, Indonesia. takdirtahir@unhas.ac.id*
[2]*Department of Medical Surgical Nursing, Faculty of Nursing, Hasanuddin University*
[3]*Department of Emergency and Disaster Nursing, Faculty of Nursing, Hasanuddin University*

Abstract

Introduction: *Postoperative hypothermia that occurs in infants may cause several complications. The aspect of thermoregulation management, such as the active and passive warming in patients during the perioperative period, is essential to prevent postoperative complications. Therefore, this study aims to know the application of active and passive warming to patients with tongue reconstruction and frenuloplasty in the Post Anaesthesia Care Unit at the Central Operation Theatre in Hasanuddin University Hospital.* ***Method:*** *A descriptive case study using a single case design method to determine the effectiveness of hypothermia risk management using active and passive warming methods on a patient undergoing tongue reconstruction and frenuloplasty. The sample in this case study is one sample, that is baby MK (3 months old), who underwent tongue reconstruction and frenuloplasty surgery. Data was collected by conducting observations, implementation, and documentation on patients.* ***Results:*** *An active warming method using air-forced equipment with a temperature setting of 38°C was given, and a passive warming method was provided by giving cotton clothes and blankets to the patient. The initial body temperature measurement was 35.5°C. During the evaluation, 30 minutes after the intervention, there was an increase in body temperature to 36°C. During the review, 60 minutes after the intervention, the body temperature rose to 36.6°C; in the last evaluation, 90 minutes after the intervention, the body temperature was increased to 37°C. The patient left the PACU with a body temperature of 37°C.* ***Conclusion****: Prevention of hypothermia in postoperative patients is essential, and methods of preventing hypothermia can be used as active warming and passive warming methods.*
Keywords**:** *Hypothermia; Active Warming; Passive Warming*.

1. INTRODUCTION

Tongue reconstruction is a medical procedure to restore speech and swallowing functions caused by disorders of the tongue structure that known as tongue tie [1], while frenuloplasty is an excision of the frenulum [2]. During surgery, one of the things that often happens is hypothermia. Hypothermia can be caused by the effect of anesthetic drug administration, low operating room temperature, and duration of action that can disrupt the body temperature regulation process in patients, resulting in hypothermia [3]. Postoperative hypothermia that occurs in infants can cause several complications, such as shivering that can increase oxygen consumption, disruption of patient comfort levels, with one of the signs being an increase in the postoperative pain scale, risk of surgical area infection, arrhythmias, increased length of stay, and even death [4]. Hypothermia occurs when the body loses heat rapidly so that the body temperature drops drastically. Losing body heat can occur through evaporation, conduction, convection, and radiation. Children are at higher risk of postoperative hypothermia than adults, because children have thinner skin and the body temperature regulation system that is not yet fully developed, which makes them more vulnerable to environmental temperature changes that make body heat loss more quickly

*Corresponding author: Takdir Tahir, Hasanuddin University, Makasar, Indonesia
E-mail : takdirtahir@unhas.ac.id
Doi : 10.35451/jkf.v7i2.2582
Received : Februari 28, 2025, Accepted: April 19, 2025, Published: April 19, 2025

and difficult to maintain a stable body temperature. Therefore, the implementation of thermoregulatory management is important during the postoperative care of pediatric patients to prevent complications from hypothermia. [5]. In the case of baby MK, who underwent tongue reconstruction and frenuloplasty surgery, several risk factors can cause hypothermia, such as the use of general anesthesia, the duration of surgery > 60 minutes, and the low room temperature. Thus, this case study was conducted to determine the application of active and passive warming to prevent hypothermia in a patient undergoing tongue reconstruction and frenuloplasty.

2. METHOD

2.1 Sample

The sample in this case study is baby MK (3 months old), who underwent tongue reconstruction surgery and frenuloplasty on December 16th, 2024. Data was collected by observing, implementing, and documenting the patient.

2.2 Instruments

The instruments used in this case study are an air-forced warmer for active warming, blankets, cotton clothes for passive warming, body temperature electrodes to measure body temperature, and a digital monitor to display the patient's body temperature in real time.

2.3 Procedure

A descriptive case study using the single case design method to determine the effectiveness of hypothermia risk management using active and passive warming methods in patients undergoing tongue reconstruction and frenuloplasty in the Central Surgery Installation (IBS) room at RSPTN UNHAS Makassar. This case study research has already applies the ethical clearance from the Faculty of Nursing Hasanuddin University with the number of letter is: 4084/UN4.14.1/TP.01.02/2024. The case study begins by providing informed consent to the patient's family as the patient's guardian, right after the surgery done when the patient was moved to the PACU room. The data collection process was carried out in the Post Anaesthesia Care Unit at Hasanuddin University Hospital by applying an air-forced warmer at 38°*C* as active warming, then changing the patient's wet clothes to dry cotton clothes and providing a blanket as passive warming. Then, a body temperature electrode is placed in the patient's axilla and connected to a digital monitor to display the patient's body temperature in real-time. After the electrodes are installed, monitoring and documenting the initial body temperature is carried out, and body temperature is evaluated at 30 minutes, 60 minutes, and 90 minutes after the intervention is given. Data collection is carried out by observing, implementing, and documenting patients. The presentation of the data uses graphs and is accompanied by a narrative to explain the results obtained from the case study**.**

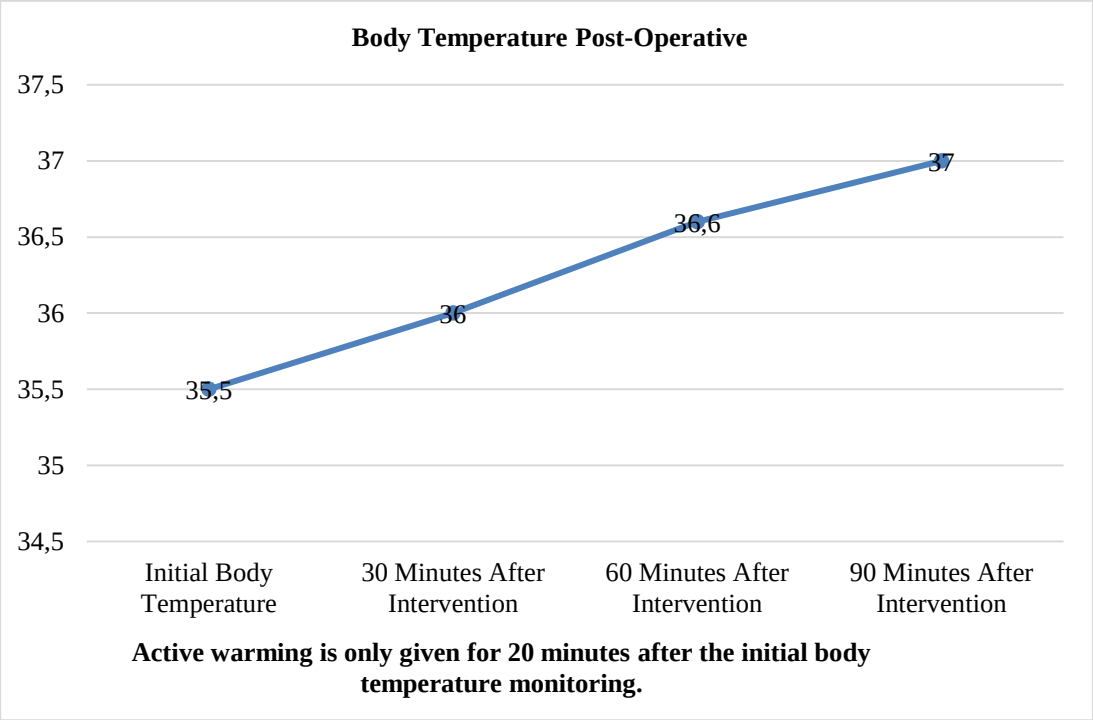
3. RESULTS

Table 1. Case Descriptive During the Pre-Operative, Intra-Operative, and Post-Operative.

Perioperative	Case Descriptive
Pre-operative	● Medical treatment: tongue reconstruction and frenuloplasty ● Medical diagnosis: tongue tip type III Kotows classification and lip tie type II Staffords classification ● Vital signs: pulse: 110x/minute, breathing: 30x/minute, temperature: 36,50C, SaO2: 98% (without oxygenation) ● Anxiety scale : 0 (there is no anxiety) ● Medical examination: laboratory values show an increase in GOT and GPT levels and a decrease in creatinine levels with the impression of an increase in the enzyme aspartate aminotransferase. ● Nursing diagnosis: risk of injury, risk of hypothermia, risk of fall

Intra-operative	● *Sign in*: 08.20 WITA; *Time out*: 09.02 WITA; *Sign out*: 10.40 WITA ● Anesthesia: general ETT ● Operation position: supine ● Insition area: mouth ● Vital signs: pulse: 154x/minute, breathing: 39x/minute, SaO2: 100% ● Device apply: ETT ● Total of entry fluid: crystalloid Asering 50 cc; Total of exit fluid: urine 10 cc, bleeding 10 cc ● Nursing diagnosis: risk of injury, risk of infection, risk of bleeding
Post-operative	● Move to PACU: 11.15 WITA ● Main problem: the patient seems to be grimacing ● Pain scale : 3 (CRIES: mild pain) ● General condition: there is a post-operative wound at the mouth cave ● Consciousness: somnolent ● Vital signs: initial temperature: 35.50C, Pulse: 158x/minute, breathing: 28x/minute, SaO2: 100% with non-rebreathing mask (NRM) 8 lpm ● Nursing diagnosis: acute pain, risk of infection, risk of fall, risk of hypothermia

Based on Table 1, multiple nursing diagnoses show up in every perioperative phase.



Graphic 1. Graphic of Monitoring Body Temperature During the Postoperative Phase in PACU.

Based on Graphic 1, the body temperature is increased after the active and passive warming interventions in the PACU.

4. DISCUSSION

When transferred to the PACU room, the patient's skin felt cold, so he was given an active warming method using air-forced warming equipment or body warmer with a temperature setting of 38°C and a passive warming method by providing clothes and cotton blankets to warm the patient's body. Body temperature measurements begin when the patient is transferred to the PACU room, and then evaluations are carried out every 30 minutes, 60 minutes, and 90 minutes thereafter. The temperature monitoring device is placed in the patient's left axilla. Based on the table above for initial body temperature measurements, the result is 35.5°C. Furthermore, for evaluation 30 minutes after the intervention, there was an increase in body temperature to 36°C. While evaluating at 60 minutes after the intervention, the body temperature rose to 36.6°C, and the skin felt warmer than before; then, at the last evaluation at 90 minutes after the intervention, the body temperature became 37°C. The patient left the PACU with a body temperature of 37°C. Meanwhile, a combination of active and passive warming is given for the initial 20 minutes, and then only passive warming is given until the patient left the PACU room. The active warming method only used for 20 minutes, because using an air-forced warmer for an extended period can irritate the patient's skin.

Postoperatively hypothermia is caused by several factors, such as cold operating room temperatures, cold IV fluids, blood transfusions, use of inhalation agents, the size of the surgical wound, decreased muscle activity (sedation), and age factors [6]. Children, especially babies, are more susceptible to hypothermia; this is due to factors such as the immaturity of the thermoregulation system in their bodies and also the thickness of the subcutaneous tissue under their skin [4]. General anesthesia also affects thermoregulatory elements and can eliminate the physiological adaptation process of fat/skin to thermoregulatory function [7] and can cause the other complications such as increased pain intensity and respiratory distress [8].

The temperature in the operating room is one of the significant risk factor for perioperative hypothermia. To minimize bacterial growth, the room temperature is typically maintained between 20°C and 24°C. However, this cooler environment can lead to hypothermia in patients, as the difference between their skin surface temperature and the surrounding air temperature can cause the patients body temperature to drop [9]. Hypothermia occurs when the body experiences skin vasoconstriction and systemic vasodilation. These conditions can result in an increased heart rate, metabolism, blood pressure, stroke volume, and vascular resistance. Additionally, hypothermia can lead to several complications, including delayed recovery, shivering, a heightened risk of wound infections, prolonged recovery time, and hemodynamic instability [10]. Therefore, nurses have an important role in managing body temperature to prevent hypothermia during the perioperative period, particularly in pediatric patients who are more vulnerable to hypothermia than adults [11]. The most common method for managing hypothermia is the use of warm cotton blankets, along with additional fabric placed against the patient’s skin. For active warming, one effective option is the use of a forced air warmer [10].

The graph shows that the patient's body temperature increased slowly after being given active and passive warming interventions. This aligns with previous research, which found that passive and active heating methods could maintain body temperature during perioperative [12]. Other research also found that cotton blanket can be given as passive warming to the postoperative patients. If the patient experiences postoperative hypothermia, it can be combined with active warming such as using an air-forced warming device [13]. In research conducted by Yoo et al., it was found that in the postoperative phase, only 2% of patients experienced hypothermia after being given active and passive warming methods [14].

Perioperative hypothermia can be a factor in increasing the risk of surgical wound infection, which can lead to extended days of stay in hospital [15]. Meanwhile, for patient baby MK, the healing condition of the surgical wound is good, so the length of stay in hospital was only 3 days after surgery. In addition, hypothermia can cause discomfort in the form of increased pain intensity in postoperative patients [16]. The initial pain assessment in the PACU using the CRIES pain scale, and the score of baby MK was 3 (mild pain). After 60 minutes of active and passive warming intervention, the pain scale decreased to 2 (mild pain). Hypothermia can lead to shivering due to exposure to cold temperatures in the operating room [17], as well as factors related to anesthesia and the use of

unheated intravenous fluids [18]. Postoperative shivering can have several side effects, including an increase in body metabolism. This elevation in metabolism can raise heart rate, cardiac output, and ventilation volume, potentially resulting in metabolic acidosis and disruption of platelet function [19]. Moreover, shivering can cause oxygen consumption and carbon dioxide production to increase by 2 to 3 times [20]. After administering the intervention, the patient's skin felt warm, and there was no sign of cold, such as shivering.

5. CONCLUSION

Preventing hypothermia in postoperative patients is very important because hypothermia can cause discomfort to the patients, such as increased postoperative pain and prolongation of hospital stay. Hypothermia prevention can be done by using active and passive warming methods, where both methods can improve the patient's body temperature significantly while in the PACU room and prevent hypothermia in the patients after tongue reconstruction and frenuloplasty surgery.

ACKNOWLEDGMENT

This research could be carried out with the institution and clinical preceptor's assistance. Therefore, the researcher thanks the two preceptors and the two research examiner lecturers, who have helped a lot through all the research processes.

REFERENCES

[1] Sarna, R. N. N. C., Bastiana., & Setyawati, T. (2022). Speech Delay Et Causa Tongue Tie: Laporan Kasus. *Journal Medical Profession, 4*(3), 289-297.

[2] Ariestiana, Y. Y., Gazali, M., & Basyar, H. (2024). Effectiveness of Frenuloplasty in Ankyloglossia on Speech Quality: A Systematic Review. *Macedonian Journal of Medical Sciences*, *12*(1), 12-21.

[3] Peixoto, C. de A., Ferreira, M. B. G., dos Santos Felix, M. M., Pereira, C. B. de M., Cândido, J. V., Rocha, V. F. R., Ferreira, L. A., & Barbosa, M. H. (2021). Factors contributing to intraoperative hypothermia in patients undergoing elective surgery. *Perioperative Care and Operating Room Management*, *22*,100150. https://doi.org/10.1016/j.pcorm.2020.100150

[4] Nemeth , M., Miller, C., & Brauer, A. (2021). Perioperative Hypothermia in Children. *International Journal of Environmental Research and Public Health, 18*(14), 1-18.

[5] Demmanggasa, V. S., Pujiastuti, N., Arif, T., & Martiningsih, W. (2024). Jenis Operasi Sebagai Determinan Utama Suhu Tubuh Pasien Anak Pasca Operasi. *Jurnal Penelitian Kesehatan Suara Forikes, 15*(4), 688-691, https://dx.doi.org/10.33846/sf15423.

[6] Febriani, F., Agustina, M., & Kapadia, R. (2020). Efektivitas selimut elektrik dalam peningkatan suhu tubuh pasien pasca operasi yang mengalami hipotermia: literature review. *Scientific Journal of Nursing Research, 2*(2), 50-53.

[7] Arfi, E. (2024). Gambaran Kejadian Menggigil Pada Pasien Pasca Operasi General Anastesi di Rumah Sakit. *Media Husada Journal of Nursing Science, 5*(2), 105-111.

[8] Arsana, W. K. A., Semedi, B. P., Martanto, T. W., & Rejeki, S. P. (2024). Complications of Postoperative Anesthesia in Pediatric Patients. *Jurnal Inovasi Global, 2*(1), 1-16.

[9] Fitriani, D., Betty., Nurohman, E., & Armanda, L. (2023). Determinan Faktor Hipotermi Pasca Operasi dengan General Anestesi di Instalasi Bedah Sentral RSUD Banten. *Health and Medical Journal. 5*(1), 50-58.

[10] Suantika, P. I. R., & Carolina, A. I. (2024). Efektivitas Penghangat Aktif dan Pasif Dalam Manajemen Hipotermia Pasien dengan Pembedahan Abdomen di Rumah Sakit Umum Daerah Bali Mandara. *Jurnal Riset Kesehatan Nasional, 8*(1), 15-21.

[11] Andayani, Q. N., Triyanto, A., & Ruswanti, A. (2024). Pencegahan Hipotermia Intraoperatif selama Laparoskopi Apendiks pada Pasien Anak di IBS RSA UGM: Studi Kasus. *Jurnal Keperawatan Klinis dan Komunitas, 8*(3), 161-172, DOI: 10.22146/jkkk.98512

[12] Okgün Alcan, A., Aygün, H., & Kurt, C. (2023). Resistive Warming Mattress, Forced-Air Warming System, or a Combination of the Two in the Prevention of Intraoperative Inadvertent Hypothermia: A Randomized Trial. *Journal of PeriAnesthesia Nursing*. https://doi.org/10.1016/j.jopan.2022.11.007.

[13] Pratiwi, N. D., Raya, N. A., & Puspita, L. M. (2021). Manajemen Hipotermia dalam Keperawatan Perioperatif pada Pasien yang Menjalani Pembedahan Abdomen: A Literature Review. *Journal Community of Publishing In Nursing, 9*(5), 497-506.

[14] Yoo, J. H., Ok, S. Y., Kim, S. H., Chung, J. W., Park, S. Y., Kim, M. G., Cho, H. B., Song, S. H., Cho, C. Y., & Oh, H. C. (2021). Efficacy of active forced air warming during induction of anesthesia to prevent inadvertent perioperative hypothermia in intraoperative warming patients. *Medicine*, *100*(12), e25235. https://doi.org/10.1097/MD.0000000000025235.

[15] Irma R, Rauch, S., Miller, C., Bräuer, A., Wallner, B., Bock, M., & Paal, P. (2021). Perioperative Hypothermia: A Narrative Review. *International Journal of Environmental Research and Public Health, 18*(16), 1-15.

[16] Ashoobi, M. T., Shakiba, M., Keshavarzmotamed, A., & Ashraf, A. (2023). Prevalence of Postoperative Hypothermia in the Post-anesthesia Care Unit. *Anesthesiology and Pain Medicine, 13*(5), 1-7. doi:10.5812/aapm-136730.

[17] Bulqis, P. M., Marsaid., Bacthiar, A., & Supono. (2024). Hubungan Lama Operasi dengan Tingkat Kejadian Post Operative Nausea and Vomiting (PONV) dan Shivering Pada Pasien Post Operasi dengan General Anesthesia. *Jurnal Keperawatan Muhammadiyah, 9*(3), 30-38.

[18] Widodo, U., Wisudarti, C. F. R., & Krispratama, A. (2021). Optimalisasi Keselamatan Pasien di Post-Anesthesia Care Unit. *Jurnal Komplikasi Anestesi, 8*(3), 76-86.

[19] Agrawijaya, R. S., Sudadi., & Pratomo, B. Y. (2024). Tata Laksana Non Farmakologi Pada Shivering Post Spinal Anesthesia. *Jurnal Komplikasi Anestesi, 11*(2), 6-16.

[20] Wulandari, R., Aprisunadi., Susanti, F., & Kalsum, U. (2024). Hubungan Lama Operasi Dengan Hipotermi Pada Pasien Pascaoperasi General Anastesi di Ruang Pemulihan Kamar Operasi RS TK.II Moh Ridwan Meuraksa. *Jurnal Bidang Ilmu Kesehatan. 14*(2), 128-137.