Intraoperative Thermal Management in a Patient Undergoing Video-Assisted Thoracoscopic Lobectomy: A Case Report

Authors: Zhao Meng, Zhang Lei, Zhang Lei

Date: 2024-04-07T00:00:00+00:00

Abstract

Thermal nursing care demonstrates favorable efficacy in preventing hypothermia in patients undergoing thoracoscopic lobectomy. Thoracoscopic lobectomy, as a minimally invasive therapeutic approach characterized by reduced surgical trauma, represents an effective clinical modality for lung cancer treatment. Intraoperative hypothermia constitutes one of the adverse conditions that substantially impacts surgical outcomes and postoperative recovery. In this case, through intraoperative therapeutic nursing interventions including the application of warming blankets, heated intravenous fluids and irrigation solutions, and airway warming, coupled with proactive assessment of factors contributing to intraoperative hypothermia and targeted nursing interventions addressing these factors, the patient' s hypothermia was effectively controlled and ameliorated, with no hypothermia-related adverse events occurring, enabling successful passage through the perioperative period. Conclusion: Thermal nursing care can effectively maintain stable intraoperative body temperature and plays a significant role in preventing hypothermia in patients undergoing thoracoscopic lobectomy.

Full Text

A Case Report of Intraoperative Thermal Care in a Patient Undergoing Thoracoscopic Lobectomy

ZHAO Meng[1], **ZHANG Lei**[1]
[1]Dongfang Hospital, Beijing University of Chinese Medicine, Beijing 100078

Abstract

Thermal insulation nursing is effective in preventing hypothermia in patients undergoing thoracoscopic lobectomy. As a minimally invasive treatment modality,

thoracoscopic lobectomy is an effective method for clinical management of lung cancer with reduced surgical trauma. Intraoperative hypothermia represents one of the adverse conditions that significantly affect surgical outcomes and postoperative recovery. In this case, intraoperative nursing interventions including thermal insulation blankets, heated intravenous fluids and irrigation solutions, and respiratory tract warming were applied. Simultaneously, factors contributing to intraoperative hypothermia were actively evaluated, and targeted nursing interventions were implemented based on these influencing factors, resulting in effective control and improvement of the patient' s hypothermia. No adverse events related to hypothermia occurred, and the patient successfully progressed through the perioperative period.

Conclusion: Thermal insulation nursing can effectively maintain stable intraoperative body temperature and plays an important role in preventing hypothermia during thoracoscopic lobectomy.

Keywords: insulation nursing; thoracoscopic lobectomy; body temperature

Introduction

Lobectomy is a commonly performed surgical procedure for lung cancer treatment in clinical practice. With the emergence of minimally invasive techniques, technological advancements, and accumulated experience, the proportion of thoracoscopic lobectomy among these surgical patients has continuously increased, effectively controlling the extent of surgical trauma and facilitating faster postoperative recovery. However, thoracoscopic lobectomy can lead to hypothermia due to multiple factors including prolonged exposure of the patient's body cavity, carbon dioxide pneumothorax, irrigation fluids, blood transfusion, intravenous fluid administration, and anesthesia duration. Intraoperative hypothermia not only adversely affects surgical smoothness but also causes significant harm to coagulation function and multiple organ systems, representing a risk factor for infection development [1-2]. Nursing serves as an effective measure for intraoperative hypothermia intervention, protecting patient body temperature, reducing complications, and improving prognostic quality [3]. This article systematically analyzes the nursing measures and effects of thermal care in thoracoscopic lobectomy patients, with the case report as follows.

Case Presentation

Patient Information and Medical History The patient was a 60-year-old male with clear consciousness who presented with cough and sputum production for over one month. Three months prior, he was evaluated at our hospital for an occupying lesion in the right upper lung. Bronchoscopic biopsy was performed, with pathology revealing infiltrating adenocarcinoma of the right upper lung.

The patient completed two cycles of chemotherapy on November 30, 2023, and December 28, 2023, with the regimen of pemetrexed disodium 1g on day 1 plus cisplatin 30mg on days 1-5, with smooth progression. On January 31, 2024, the

chemotherapy regimen was changed to albumin-bound paclitaxel for injection 400mg on day 1 plus cisplatin 30mg on days 1-5, also proceeding smoothly.

On February 29, 2024, the patient presented to our outpatient department seeking further treatment and was admitted with a diagnosis of "right upper lung adenocarcinoma chemotherapy." Admission symptoms: clear consciousness, stable mental state, occasional cough without sputum, no chest tightness or pain, normal appetite and sleep. Appearance: normal demeanor, dull complexion, moderate build, normal posture. Voice: clear speech, fluent language, no abnormal breath odor. Tongue and pulse: dark red tongue, thin white coating, wiry and slippery pulse.

Physical Examination The patient measured 169cm in height and 66kg in weight, with vital signs as follows: temperature 36.1°C, pulse 76 beats/min, respiration 18 breaths/min, blood pressure 143/97mmHg. Arterial blood gas analysis showed pH 7.41, PaO_2 80mmHg, $PaCO_2$ 40mmHg. The patient was conscious with no jaundice of the skin, no palpable superficial lymphadenopathy, symmetrical head and facial features, equal-sized round pupils with sensitive light reflex, no scleral jaundice, no eyelid edema, centered tongue extension, no cyanosis of lips, no pharyngeal congestion, no abnormal secretions from ears or nose, no tonsillar enlargement. The neck was soft without resistance, no jugular venous distension or abnormal carotid pulsation, trachea midline, no thyroid enlargement. Cardiac border was normal on percussion, regular rhythm, no pathological murmurs on cardiac auscultation. Abdomen was flat and soft without tenderness, liver and spleen not palpable below ribs, negative percussion pain in liver and spleen regions. No three-concave sign, symmetrical chest, clear breath sounds, no moist rales or wheezing, no pleural friction rub. No joint swelling or pain, no clubbing of fingers.

Specialized Examination CT scan revealed a 4.0cm$×$3.6cm mass in the left upper lung with lobulation and short spiculation at the margins. Routine preoperative examinations including complete blood count, electrocardiogram, abdominal ultrasound, whole-body bone scan, and brain MRI showed no abnormalities, and surgical treatment was planned.

Diagnosis **Chinese Medicine Diagnosis:** Lung cancer, lung-spleen deficiency pattern, phlegm-stasis intermingling pattern
Western Medicine Diagnosis: Right upper lung adenocarcinoma, right upper lung adenocarcinoma chemotherapy (cycle 3), hilar lymph node metastasis, mediastinal lymph node metastasis, coronary artery stenosis, fatty liver

Postoperative Course: On postoperative day one, the patient was conscious and stable, reporting wound pain and occasional cough without sputum or chest tightness. Temperature was normal, sleep was adequate, no food intake, normal urine output. Physical examination revealed normal bilateral lung breath sounds without moist or dry rales, right chest drainage 124ml. On postopera-

tive day two, the patient was conscious and in good spirits, reporting decreased wound pain, occasional abdominal distension and pain, no cough, sputum, or chest tightness. Temperature normal, good sleep and diet, no bowel movement, normal urine. Examination showed good bilateral lung breath sounds without rales, right chest drainage 300ml, no air leakage.

On postoperative day three, the patient was conscious and in good condition, reporting reduced wound pain, occasional cough without sputum, no chest tightness. Temperature normal, good sleep, diet, and activity, no bowel movement, normal urine. Examination showed good bilateral lung breath sounds without rales, right chest drainage 0ml, no air leakage. On postoperative day four, the patient was in good spirits, reporting decreased wound pain, occasional cough with sputum. Temperature normal, normal bowel and bladder function. Examination showed good bilateral lung breath sounds without rales, right chest drainage 190ml, no air leakage.

On postoperative day five, the patient was in good condition with adequate sleep and diet, occasional wound pain, normal temperature, good activity, no cough or sputum. Examination showed good bilateral lung breath sounds without rales, right chest drainage 0ml, no air leakage. On postoperative day six, the patient was in good condition with adequate sleep and diet, significantly relieved wound pain, normal temperature, good activity, no cough or sputum. Examination showed good bilateral lung breath sounds without rales, right chest drainage 0ml, no air leakage.

On postoperative day seven, the patient was in good condition with adequate sleep and diet, significantly relieved wound pain, normal temperature, good activity, no cough or sputum. Examination showed good bilateral lung breath sounds without rales. Chest radiography indicated good lung reexpansion, chest tube was removed, and the patient was discharged with instructions to avoid wind-cold, maintain proper living habits, and moderate diet. Wound dressing changes were scheduled every 2-3 days, suture removal after three weeks, outpatient follow-up, and prompt consultation for any discomfort.

Nursing Assessment

Pain Assessment Pain was assessed using the Visual Analogue Scale (VAS) method, which quantifies subjective pain intensity on a 10cm scale with endpoints of "0" (no pain) and "10" (most severe intolerable pain), where higher scores indicate greater pain severity. This patient' s pain score was 1, indicating mild pain.

Anxiety Assessment Anxiety was evaluated using the Self-Rating Anxiety Scale (SAS), where scores <50 indicate normal, 50-60 mild anxiety, 61-70 moderate anxiety, and >70 severe anxiety. Due to anxiety and tension related to unchanged tumor size after chemotherapy and fear of surgery, the patient was introduced to the SAS scale, scoring 65 points, which was assessed as moderate

anxiety.

Risk Assessment for Intraoperative Temperature Dysregulation The patient' s temperature sensitivity was evaluated, including tolerance to thermal blankets and warmed irrigation solutions. Efforts were made to minimize surgical time, employ carbon dioxide warming, increase operating room temperature preoperatively, and provide timely warming after disinfection. The Cold Discomfort Scale (CDS), developed by Lundgre et al. in Sweden based on numerical rating methods, uses integer values from 0-10 to assess patients' cold sensation, where 0 indicates no cold sensation and 10 indicates intolerable cold. The patient' s subjective score was 2.

Nursing Diagnosis and Plan

Based on the patient' s physical assessment and chief complaints, the following issues were identified: prolonged disease course with poor post-chemotherapy effects significantly impacting physical and mental health and quality of life. According to relevant physiological and psychological factors, preoperative education was conducted one day before surgery.

Risk for Intraoperative Temperature Dysregulation: High-risk factors for hypothermia, ranked from highest to lowest, include: neonates, operating room temperature below 21°C, burn patients, general anesthesia patients, elderly patients, hypothermia, thin body habitus, and massive hemorrhage.

Nursing Plan: Targeting relevant risk factors, intraoperative warming blankets and warmed irrigation solutions and carbon dioxide were used to effectively prevent intraoperative hypothermia in thoracoscopic lobectomy patients.

Preoperative Preparation The patient was an elderly male. One day preoperatively, physical and nutritional status were assessed, and instructions for entering the operating room were provided to alleviate surgical anxiety and increase confidence. Intraoperative supplies were prepared in advance according to actual conditions, surgical plans were optimized to minimize operative time, and communication with anesthesiologists and surgeons was conducted to adjust operating room temperature (25-28°C) and humidity (50%). All required irrigation and infusion fluids were placed in a constant-temperature box one day before surgery and warmed to 37°C.

Intraoperative Thermal Management On the day of surgery, preoperative monitoring showed BP 140/90mmHg, P 78 beats/min, R 16 breaths/min, temperature 36.4°C. Operating room temperature was maintained at 25-28°C with humidity at 50%. The patient was wrapped in a cotton quilt and wore a hat to maintain body temperature upon entering the operating room. After intravenous infusion, dressings were promptly applied to skin surfaces to reduce heat loss.

Temperature Monitoring: Nasopharyngeal temperature was measured using a probe connected to a vital signs monitor inserted into the nasal cavity to a depth of 7-10cm (distance from nasal ala to earlobe), secured with adhesive tape after stable readings. Temperatures recorded were: 36.5°C before anesthesia induction, 36.9°C at 30 minutes after surgical start, and 36.6°C at surgical completion.

Active Warming Measures: Intraoperative warming blankets provided constant warm airflow for patient thermal protection [4-5]. Limb exposure was minimized, and anesthesiologists selected appropriate anesthetic agents and methods based on patient condition. Irrigation and infusion fluids were used directly from the constant-temperature box. For patients undergoing mechanical ventilation, the endotracheal tube was connected to a heat and moisture exchanger maintaining temperature at 22-26°C and humidity at 55-65% to reduce stimulation from cold external air. Foot covers were applied to lower extremities to promote venous return and achieve warming effects. Concurrent evaluation of potential causes of intraoperative hypothermia in this patient suggested possible factors including prolonged exposure time due to lengthy surgery, anesthesia-induced inhibition of thermoregulatory centers, blood loss, and massive fluid infusion [6-7]. Any signs of hypothermia were promptly corrected.

Environmental Control: Intraoperative efforts maintained patient skin dry and clean using disposable sterile adhesive surgical drapes to collect blood drainage for storage in fluid collection bags. Perioperative temperature fluctuations are shown in .

Postoperative Care Vital Signs Monitoring: Postoperatively, the patient was wrapped in a cotton quilt and safely returned to the ward, with handover to ward nurses regarding temperature, skin condition, tubes, and urinary catheter. Postoperative vital signs were closely monitored, showing BP 130/80mmHg, P 76 beats/min, R 16 breaths/min, temperature 36.6°C. CDS scoring yielded 2 points, with no hypothermia occurring.

Positioning and Drainage Care: The patient was promptly returned to the ward with gentle transfer. After general anesthesia, the patient remained supine without a pillow for 6 hours. The closed thoracic drainage was properly secured to maintain system integrity, with regular checks for system closure and dislodgement. The long tube of the water seal bottle was immersed 3-4cm in water, and the drainage tube was double-clamped when moving the patient or changing the drainage bottle to prevent air leakage and complications.

Postoperative Complication Prevention and Comfort Management

Due to surgical trauma, wound presence, and intraoperative hypothermia, patients undergoing this procedure are more susceptible to infection, coagulopathy, metabolic disturbances, and cardiovascular complications such as myocardial ischemia [8-9]. Therefore, postoperative assessment and intervention for these

potential risks require strengthening. Vital signs were closely monitored with attention to microcirculation status, wound disinfection was intensified, and heart rate and blood pressure fluctuations were carefully analyzed. Close communication with patients and families facilitated understanding of status changes, identification of potential nursing problems, and targeted solutions. Pain and discomfort were carefully assessed using the VAS method at various time points, with interventions including distraction techniques, proper positioning, cold/hot compresses, massage, and pharmacological analgesia when necessary.

Outcomes

Preoperative scores were VAS 1, SAS 65, and CDS 2. Through preoperative education and intraoperative nursing care, postoperative 30-minute scores were VAS 5 and CDS 2; postoperative 24-hour scores were VAS 6, SAS 50, and CDS 2, demonstrating significant efficacy (see).

During hospitalization, the patient maintained good mental status without infection, coagulation abnormalities, myocardial ischemia, arrhythmia, or other systemic organ function imbalances. Vital signs remained stable without recurrent temperature abnormalities. The patient reported no discomfort other than pain, demonstrated good treatment and nursing compliance, and progressed smoothly with rehabilitation training, with gradual improvement in pulmonary function and quality of life. Pre-discharge psychological assessment showed SAS score of 39, indicating effective anxiety relief, and hypothermia risk assessment scale score of 9.6, indicating low-risk status without significant abnormalities.

Post-Discharge Continuing Care Post-discharge rehabilitation intervention and exercise remain necessary for this patient population. Patients were instructed to perform regular autonomous sputum expectoration and lung function training using methods such as balloon blowing, with moderate exercise when physical condition permitted. Nutritional balance was emphasized, ensuring adequate intake of high-quality protein, vegetables, and fruits [10-11]. Healthy lifestyle habits were encouraged, including early sleep and avoiding staying up late, while maintaining optimistic and positive attitudes to enhance confidence. Good communication relationships were established using WeChat, telephone, and other modalities for real-time monitoring and guidance of nursing problems during home rehabilitation.

Discussion

The clinical application rate of thoracoscopic lobectomy continues to increase. This procedure offers advantages including short hospital stays, rapid recovery, and minimal trauma, effectively prolonging survival and controlling lung cancer progression. However, multiple factors influence surgical outcomes, among which surgical smoothness and intraoperative adverse events are important considerations. Intraoperative hypothermia not only causes shivering that affects surgical smoothness but also leads to compromised immunity and increased

infection susceptibility, while causing microcirculation and coagulation abnormalities [12], which is extremely detrimental to blood supply in multiple organ systems. Therefore, prevention, diagnosis, treatment, and nursing intervention for intraoperative hypothermia are critically important in this surgical population.

Nursing represents an extremely important clinical intervention during the perioperative period for this procedure, playing an active role in intraoperative hypothermia prevention and nursing intervention improvement. Nursing can achieve the goals of increasing patient temperature and improving prognosis through multifaceted interventions [13]. In the new era of progress and development, the "14th Five-Year Plan" continues to empower medical staff, utilizing new technologies and methods to deepen quality nursing care and enrich and expand the scope and connotation of nursing services [14]. Through interventions including room temperature regulation, warming blankets, heated intravenous fluids and irrigation solutions, and respiratory tract warming, this patient' s temperature was effectively maintained. No anesthesia awakening delay related to intraoperative hypothermia occurred, and no infection, coagulation abnormalities, myocardial ischemia, arrhythmia, or other systemic organ ischemia or functional imbalances appeared. These results demonstrate that early detection of intraoperative hypothermia and implementation of effective intervention nursing measures constitute an important foundation and prerequisite for improving prognosis. The application of comprehensive thermal nursing methods in thoracoscopic lobectomy patients can effectively maintain intraoperative body temperature, ensure prognostic quality and surgical safety, and demonstrates high application value.

Additionally, informed consent was obtained from the patient and family for publication of this case report, and this study has no relevant conflicts of interest.

References

[1] Li Xiaoying, Zhang Hong, Wu Lina, et al. Study on clinical outcomes of intraoperative hypothermia in general anesthesia patients and its nursing prevention strategies[J]. Journal of Changchun University of Chinese Medicine, 2021, 37(1): 153-156.
[2] Yuan Yinghong, Song Huimin, Lin Ying, et al. Effect of hypothermia prevention nursing on perioperative bleeding, coagulation function and stress response in elderly patients undergoing total hip arthroplasty[J]. Geriatrics & Health Care, 2023, 29(1): 100-104.
[3] Liu Weihong, Kong Shanshan, Liu Yan, et al. Application study of 1M3S management model in prevention of intraoperative hypothermia in surgical patients[J]. Journal of Nursing Management, 2020, 20(7): 462-465.
[4] Li Y, Liang H, Feng Y. Prevalence and multivariable factors associated with inadvertent intraoperative hypothermia in video-assisted thoracoscopic surgery: a single-center retrospective study[J]. BMC Anesthesiol, 2020, 20(1): 25.
[5] Okada N, Fujita T, Kanamori J, et al. Efficacy of prewarming prophylaxis

method for intraoperative hypothermia during thoracoscopic esophagectomy[J]. Esophagus, 2020, 17(4): 385-391.
[6] Liu Lichun, Liu Hanyun. Influencing factors of intraoperative hypothermia in patients undergoing thoracoscopic radical esophagectomy[J]. Contemporary Nurse (Early Dec), 2022, 29(9): 132-135.
[7] Yan Lupei, Yao Lili, Li Yuerong, et al. Research progress on risk prediction models for unplanned intraoperative hypothermia in surgical patients[J]. Journal of Nursing, 2021, 28(6): 13-16.
[8] Guan Enling, Sun Jianliang, Chen Shuping, et al. Related factors and management strategies of intraoperative hypothermia in elderly patients[J]. Chinese Journal of Geriatrics, 2019, 38(7): 783-786.
[9] Xu Yu. Effect of upper body warming with inflatable warming blanket on patients in lateral position undergoing thoracoscopic surgery[J]. China Medical Herald, 2022, 19(6): 167-170.
[10] Zhang Z, Inman C, Waters D, et al. Effectiveness of application of carbon-fibre polymer-fabric resistive heating compared with forced-air warming to prevent unintentional intraoperative hypothermia in patients undergoing elective abdominal operations: A systematic review and meta-analysis of randomised controlled trials [J]. J Clin Nurs, 2020, 29(23-24): 4429-4439.
[11] Ge Jingwu, Du Xiangfei, Qiao Mei. Intervention effect of upper body warming with inflatable warming blanket on intraoperative hypothermia in patients in lateral position undergoing thoracoscopic surgery[J]. Chinese Journal of Practical Nursing, 2021, 37(10): 733-738.
[12] Zhong Changyan, Yi Fengqiong, Hu Jun, et al. Comparison of effects between resistive heating pad and inflatable warming blanket in preventing hypothermia in patients undergoing thoracoscopic surgery[J]. Journal of Nursing Science, 2019, 34(4): 39-41.
[13] Tian YN, Gao WY, Tian XR, et al. Comparative Efficacy of Six Active Warming Systems for Intraoperative Warming in Adult Patients Undergoing Laparoscopic Surgery: A Systematic Review and Network Meta-Analysis[J]. Ther Hypothermia Temp Manag, 2023, 13(3): 92-101.
[14] Tang Ling, Guo Hong, Zhu Jing, Zhang Jing, Li Ye, Xu Jingjin. Interpretation of "Beijing '14th Five-Year Plan' Development Plan for Traditional Chinese Medicine Nursing" [J]. Chinese Journal of Integrative Nursing, 2022, 8(7): 157-162.

Author Information

First Author: ZHAO Meng, female, Han ethnicity, bachelor' s degree, charge nurse, Operating Room Nurse at Dongfang Hospital, Beijing University of Chinese Medicine.
Correspondence Address: No. 6, Fangxingyuan Area 1, Fangzhuang, Fengtai District, Beijing, Postal Code: 100078.
Contact: 13810522346.
Research Interests: Operating room specialized nursing.
E-mail: 454080529@qq.com

Corresponding Author: ZHANG Lei, female, Han ethnicity, bachelor' s degree, charge nurse, Operating Room Head Nurse at Dongfang Hospital, Beijing University of Chinese Medicine.
Correspondence Address: No. 6, Fangxingyuan Area 1, Fangzhuang, Fengtai District, Beijing, Postal Code: 100078.
Contact: 18601288102.
Research Interests: Operating room specialized nursing.
E-mail: 81288092@qq.com

Note: Figure translations are in progress. See original paper for figures.