

Perioperative Nursing Care for Patients with Lung Cancer Undergoing Total Pneumonectomy

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How to cite this paper: Xin, Z.Y., Tu, K.L., Wu, H.P., Li, C.Z. and Zhong, J.D. (2022) Perioperative Nursing Care for Patients with Lung Cancer Undergoing Total Pneumonectomy. *Journal of Cancer Therapy*, 13, 234-241.

<https://doi.org/10.4236/jct.2022.134019>

Received: March 14, 2022

Accepted: April 25, 2022

Published: April 28, 2022

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Abstract

Objectives: To explore the perioperative nursing care for lung cancer patients undergoing total pneumonectomy, and to promote their rehabilitation.

Methods: We will provide preoperative assessment and education in the aspects of respiratory function, diet, and psychology to patients undergoing total pneumonectomy, and provide continuous postoperative management about posture, fluid, and respiratory to help patients diagnosed with lung squamous cell carcinoma and underwent total pneumonectomy to reduce their postoperative complications and improve their overall quality of life.

Results: 78.9% of lung cancer patients who underwent total pneumonectomy achieved a better outcome and prognosis by receiving the above nursing program. **Conclusion:** With large lung cancer tumors, the surgical trauma is highly invasive and the resection is extensive. Management of the patient's respiratory tract is the focus of perioperative nursing and the key to preventing the development of related postoperative complications.

Keywords

Lung Squamous Cell Carcinoma, Total Pneumonectomy, Perioperative, Nursing

1. Introduction

The incidence of non-small cell lung cancer (NSCLC) was relatively high among malignant tumors in China [1]. Surgical resection is the first-choice treatment for early-stage NSCLC [2]. However, the patients will face different degrees of pulmonary dysfunction and low exercise tolerance after surgery, resulting in serious adverse effects on their quality of life [3]. Due to the extensive resection of

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lung cancer tumors, highly invasive surgical trauma, and risky surgical procedures, perioperative nursing care is required to reduce complications after surgery, promote patients' rehabilitation, and improve their quality of life [4] [5]. Therefore, we should explore how to provide good perioperative nursing care for patients and prevent their complications after total pneumonectomy. Based on the nursing experience of 19 patients who underwent total pneumonectomy for lung squamous cell carcinoma in our department, it is reported as follows.

2. Clinical Data

2.1. General Materials

From September 16, 2019, to October 28, 2021, 78 patients with lung cancer undergoing pneumonectomy were selected as the research objects. It included 61 male patients and 17 female patients, with an age range of 41 - 78 years and an average age of 62.21 ± 9.29 . All patients were diagnosed by pathological examination, including 19 cases of squamous cell carcinoma, 37 cases of adenocarcinoma, 15 cases of adenosquamous carcinoma, and 7 cases of differentiated small cell carcinoma. 43 cases underwent right pneumonectomy and 35 cases underwent left pneumonectomy.

2.2. Therapy Methods and Results

The average postoperative hospital stay was from 6 to 34 days, and all of them underwent total pneumonectomy for the affected side of the lung cancer. 65 cases achieved a good postoperative rehabilitation outcome and had regular follow-up examinations, while 13 cases were presented with serious postoperative complications including heart failure, respiratory failure, and acute respiratory distress syndrome, and 2 cases died.

3. Nursing

3.1. Preoperative Nursing

3.1.1. Preoperative Preparation

Due to the extensive resection of lung cancer patients with highly invasive surgical trauma and risky surgical procedure, it is necessary to actively cooperate with the surgeon before the operation to complete the relevant tests and prepare the patient for adequate blood matching to ensure safe surgery. The blood pressure, preoperative blood matching, hair shaving at the surgical area, or skin testing of drugs were finished the day before the surgery with instructions on perioperative precautions.

3.1.2. Diet and Life Care

The malignant tumor is a consumptive disease because of the large postoperative trauma and a large amount of exudation, so nutrient intake and protein supplementation are very important [6]. The preoperative nutritional risk was scored for patients using the "Inpatient Nutritional Risk Screening Scale" in the hospi-

al. A total score of ≥ 3 on the Inpatient Nutrition Risk Scale should be reported to the surgeon in charge, who will also arrange for the intervention of a nutritionist to assess and jointly develop a nutrition plan. The responsible nurse implemented the nursing intervention of nutritional support and consults with the nutrition specialist nurse when necessary, regular monitoring and assessment of the patient's nutritional level with appropriate adjustment of the nutritional plan; absolute abstinence from smoking for 2 weeks prior to surgery; The patients were advised to keep warm and prevent catching a cold. The patients were instructed to follow a high protein, high calorie, and high vitamin diet.

3.1.3. Respiratory Tract Management

1) Preoperative treatment with oxygen nebulized inhalation to eliminate sputum as prescribed by the doctor. 2) Guidance on abdominal respiration with retracted lips: At the beginning of training, the patient is in a semi-recumbent position with knees flexed, maintaining calm breathing, and when performing abdominal respiration, they mainly exercise the diaphragm and pay attention to the gradual increase in the upper and lower diameter of the thorax during inspiration. When exhaling, they must retract their lips and abdominal muscles to ensure that the abdominal wall is subsided, exhale through the mouth and then inhale through the nose. When inhaling, they should relax the abdominal muscles and let the abdomen expand as much as possible, but never let the chest expand; when taking deep breaths, the patient should exhale the CO_2 stagnated at the bottom of the lung. 3) Guidance on chest expanding deep breathing exercises: The patient is in a recumbent position and exercises in a relaxed state, exhaling first and then inhaling, and after inhaling deeply through the nose, the patient raises and expands the thorax, pauses slightly, and then slowly exhales out through the mouth [7]. 4) According to individual health conditions, the patients should be instructed to climb the stairs, take Baduanjin exercise, blow up balloons or use a respiratory function trainer to improve their cardiopulmonary function. The above nursing measures were performed with the main purpose of improving the patient's pulmonary function and their tolerance to the surgical procedures. In addition, the abdominal respiration with retracted lips, chest expansion, and deep breathing can efficiently clear the secretions inside the patient's respiratory tract in a short time and thus reduce the risk of mediastinal shift caused by clearing the secretions in the respiratory tract, as well as reduce the occurrence of other complications such as postoperative pneumonia and pulmonary atelectasis, which largely improves the patient's quality of life.

3.1.4. Physical Training

The main preoperative physical exercises included: 1) Brisk walking: The prescription for walking exercises based on the results of the preoperative 6-minute walking test (6 MWT). If the distance of 6 MWT is less than 450 meters, they may walk once a day for 20 minutes. If the distance of 6 MWT is greater than or equal to 450 meters, they may walk once a day for 30 minutes. 2) Resistance

training: a) Pushing wall exercise: Stand facing the wall at an arm's length from it. Relax completely with the legs apart at shoulder width. Keep the knees straight with the heels on the floor. Lean the upper body forward as much as possible at any suitable angles. Hold this position for 10 to 30 seconds. b) Sit and stand training: Stand in front of a chair and keep both feet apart at shoulder width, and put the back of the chair against the wall. Bend your knees and hips slowly while using both arms raised in the front to keep in balance, and sit on the chair at the end. Pause for a second, rest on the chair with full body weight, step down on your heels and return to a standing position with knees and hips extended. c) Abdominal crunch in a seated position: Sit firmly in a stable and armless chair with both feet resting flat on the floor at shoulder width. Hold the chair with both hands on the two sides of the edge, inhale with the legs moving closer to the body, keeping the neck and back straight. Place the legs back on the ground slowly and finish the exercise. The above three exercises can be done at a frequency of 10 - 12 times per group, 3 groups per day, with an interval of 5 minutes each. 3) Bedside rehabilitation bicycle: The patient's target heart rate was calculated according to the patient's 6 MWT assessment [target heart rate = (maximum heart rate - minimum heart rate) * 60% - 80% + minimum heart rate], and the active mode can be selected for the patient on the bedside training and monitoring system, and the training target should be set for 20 min per time and twice a day. As a complex surgery with a high * degree of trauma, the total pneumonectomy procedure requires a good preoperative physical condition, which has a significant impact on the postoperative rehabilitation and can enhance the patient's tolerance of surgery and reduce the incidence of postoperative complications. The appropriate amount of physical training according to your physical condition can effectively help patients improve their cardiopulmonary function, and enhance their aerobic metabolism and physical function in preparation for the next surgery.

3.1.5. Psychological Nursing Interventions

The Self-rating Anxiety Scale (SAS) is applied to assess the patient's psychological well-being [8], if the SAS score is ≥ 50 , we will provide psychological support and if necessary, invite a counselor for intervention. (If SAS scores are applied, additional evaluation results can be considered in this section). Explain to the patients about the knowledge related to the disease and precautions for preoperative examination, etc.; establish better communications between nurses and patients by listening to patients' complaints and knowing their thoughts; eliminate their nervousness; encourage patients with successful surgery cases to help them accept treatment more easily and get through the perioperative period smoothly.

3.2. Postoperative Nursing

3.2.1. General Nursing Care

The patient should rely on the healthy lung for compensatory respiration after total lung resection, and oxygen should be administered by the regular double-lumen

nasal catheter at a medium flow rate within 48 hours after surgery, which can be changed to low-flow oxygen or intermittent oxygen within 3 - 5 days after surgery to increase the oxygen content of tissue cells and improve the anoxia symptoms. The patients should choose a high-calorie, high-protein, and high-vitamin diet according to the guidance. It is advisable to have a light diet to avoid complications of chylothorax because of the routine lymph node dissection during surgery. It is important to eat more crude fiber vegetables and fruits to keep the bowel movement smooth. Do not use force to defecate as this may cause the insufficient blood supply to the vital organs, and if necessary, use a glycerin enema or laxatives.

3.2.2. Position Management

Before the thoracic duct is removed, the patient should be advised to adopt the 1/4 lying position on the affected side and avoid lying on the healthy side to prevent pressure on the healthy side of the lung tissue, which will affect the respiratory and circulatory functions.

3.2.3. Fluid Management

Due to the redistribution of blood after total lung resection, the blood volume of pulmonary circulation on the healthy side increases and so does the cardiac load, then if the infusion speed is too fast and the infusion volume is too much, it is easy to induce pulmonary edema and left heart failure. Therefore, the infusion rate should be strictly controlled at 20 - 40 drops/min, and the 24 h infusion volume should not exceed 2000 ml.

3.2.4. Respiratory Tract Nursing

Common respiratory complications after total pneumonectomy include pulmonary infection, pulmonary atelectasis, hypoxemia, and respiratory failure [9]. The incidence is mainly related to the inflammatory infiltration of the respiratory tract due to long-term smoking, squeezing and rubbing the lung lobes during surgery, reduced compliance of the residual lung after surgery, inhibition of cilia movements, incision pain limiting coughing, and other factors. Patients should be encouraged to practice daily abdominal respiration with retracted lips and effective coughing. When it is difficult to expel viscous sputum, oxygen nebulizer inhalation can help dilute the sputum. It is important to monitor the position of the trachea in patients after total pneumonectomy to prevent mediastinal shift and to assist the surgeon in clamping off or opening the thoracic duct at regular intervals.

3.2.5. Activities and Exercises

1) General activities: Guidance for patients to brush their teeth with that hand on the affected side, to eat and drink, and to turn over to adjust their position by themselves. 2) Limb functional exercise: The main activities within 1 - 3 days after surgery should be bed-based with the gradual exercise of both upper and lower limbs to prevent venous thrombus embolism (VTE). Guidance for the pa-

tient to do both hands clenching and unclenching exercises with both upper limbs, bilateral wrist rotation exercises, elbow flexion exercises, elevation exercises with both upper limbs, to lift the affected hand over the head to touch the opposite ear, abduction and adduction exercises of the shoulder joints; ankle pump exercise with both lower limbs, knee flexion exercise with both legs, elevation exercise with both lower limbs, air pedal bicycle exercise with both legs. They should take the above exercises 10 - 15 times/group, 3 groups/day gradually according to their own capabilities; 3) Respiratory function exercise: a) Abdominal respiration with retracted lips put both hands on the abdomen to feel its rise and fall, inhale deeply through the nose with a bulging belly, hold it for 3 seconds and then retract the lips to do a slow exhalation like whistling, exhale with the recessed abdomen, apply the right hand to press down forward to help the diaphragm return, and when breathing control the time of inhalation and exhalation at 1:2 - 1. Patients can perform the exercise in standing, sitting, or semi-recumbent position, 4 - 6 times per group in a row for 15 minutes each time. b) Chest expansion and deep breathing with hands crossed in front of the chest to reduce the lateral thoracic wound tension, the patient takes a deep inhalation from the nose and then raises and expands the thorax, and then slowly exhales through the mouth. This exercise should be performed 3 - 5 days after the surgery by the patients with the instructions to take a sitting or standing position if possible and keep the upper body in the exercise position leaning slightly forward with a breathing rate of 5 - 6 times/min, 10 minutes each time, 2 times/day. 3) Bedside rehabilitation bicycle: According to the patient's 6 MWT assessment, [target heart rate = (maximum heart rate - minimum heart rate) * 60% - 80% + minimum heart rate], and according to the patient's degree of rehabilitation and fatigue after exercise, the appropriate exercise training mode will be selected for the patient with reference to their preoperative pulmonary function results: passive mode training for oxygenation index (PO_2/FIO_2) < 400, 10 min per exercise, 3 times/day, and active mode training for oxygenation index (PO_2/FIO_2) \geq 400, 20 min per exercise, 2 times/day.

3.2.6. Pain Nursing

The patient should be given adequate postoperative analgesia to avoid the surgical incision pain from interfering with chest expansion and deep breathing exercises, coughing, and expelling sputum [10]. Patients usually carry a self-controlled analgesic pump provided by the anesthesiologist after surgery, and as prescribed by the physician, 40 mg of parecoxib sodium is administered intravenously q12h and together with oral painkiller tablets. The "pain scale" assesses the area, quality, and degree of pain after surgery is available. Most of the patients had mild pain with a score from 1 to 3, and 5 patients had moderate pain with a score from 4 to 6 within 3 days after surgery. Patients with mild pain, we played light music and communicated more with them to distract their attention from the pain and discomfort. For patients with moderate pain, they were given painkillers as prescribed by the doctor, and the effect was good for all, and the pain

score could be controlled by 2 points.

3.3. Data Analyses

SPSS16.0 software was adopted for statistical analysis, the measurement unit was mean \pm standard deviation (Mean \pm SD), and the counting data was expressed as a percentage (%).

4. Conclusion

Patients are at higher risk and under greater physical and psychological stress due to the extensive resection of lung cancer tumors and large invasive areas. Therefore, nursing staff should pay more attention to their perioperative care, and enrich the relevant nursing experience, they can improve the perioperative nursing process of total pneumonectomy for lung cancer patients and focus on preoperative respiratory tract management, diet, and life care, physical training, and psychological care, etc. In addition, we will help patients achieve better rehabilitation by providing adequate preoperative preparation and comprehensive postoperative care in terms of position management, fluid management, respiratory tract management, activities, and exercises.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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