ISSN 2307-8960 (online)

World Journal of *Clinical Cases*

World J Clin Cases 2023 February 26; 11(6): 1224-1433

Published by Baishideng Publishing Group Inc

World Journal of Clinical Cases

Contents

Thrice Monthly Volume 11 Number 6 February 26, 2023

OPINION REVIEW

MINIREVIEWS

ORIGINAL ARTICLE

Retrospective Study

Clinical Trials Study

Observational Study

World Journal of Clinical Cases

Thrice Monthly Volume 11 Number 6 February 26, 2023

Contents

World Journal of Clinical Cases

Thrice Monthly Volume 11 Number 6 February 26, 2023

Contents

NAME OF JOURNAL
World Journal of Clinical Cases

ISSN
ISSN 2307-8960 (online)

LAUNCH DATE
April 16, 2013

FREQUENCY
Thrice Monthly

EDITORS-IN-CHIEF
Bao-Gan Peng, Jerzy Tadeusz Chudek, George Kontogeorgos, Maurizio Serati, Ja Hyeon Ku

EDITORIAL BOARD MEMBERS
https://www.wjgnet.com/2307-8960/editorialboard.htm

PUBLICATION DATE
February 26, 2023

COPYRIGHT
© 2023 Baishideng Publishing Group Inc

INSTRUCTIONS TO AUTHORS
https://www.wjgnet.com/bpg/gerinfo/204

GUIDELINES FOR ETHICS DOCUMENTS
https://www.wjgnet.com/bpg/GerInfo/287

GUIDELINES FOR NON-NATIVE SPEAKERS OF ENGLISH
https://www.wjgnet.com/bpg/gerinfo/240

PUBLICATION ETHICS
https://www.wjgnet.com/bpg/GerInfo/288

PUBLICATION MISCONDUCT
https://www.wjgnet.com/bpg/gerinfo/208

ARTICLE PROCESSING CHARGE
https://www.wjgnet.com/bpg/gerinfo/242

STEPS FOR SUBMITTING MANUSCRIPTS
https://www.wjgnet.com/bpg/GerInfo/239

ONLINE SUBMISSION
https://www.f6publishing.com

E-mail: bpgoffice@wjgnet.com https://www.wjgnet.com

World Journal of Clinical Cases

Submit a Manuscript: https://www.f6publishing.com

World J Clin Cases 2023 February 26; 11(6): 1330-1340

DOI: 10.12998/wjcc.v11.i6.1330

ISSN 2307-8960 (online)

ORIGINAL ARTICLE

Observational Study

Effect of continuous nursing combined with respiratory exercise nursing on pulmonary function of postoperative patients with lung cancer

Qiong-Xiang Qiu, Wen-Juan Li, Xi-Miao Ma, Xue-Hua Feng

Specialty type: Nursing

Provenance and peer review: Unsolicited article; Externally peer reviewed.

Peer-review model: Single blind

Peer-review report's scientific quality classification

Grade A (Excellent): 0
Grade B (Very good): B
Grade C (Good): C
Grade D (Fair): 0
Grade E (Poor): 0

P-Reviewer: Chouaid C, France; Mizuno N, Japan

Received: December 19, 2022
Peer-review started: December 19, 2022
First decision: January 9, 2023
Revised: January 16, 2023
Accepted: February 3, 2023
Article in press: February 3, 2023
Published online: February 26, 2023

Qiong-Xiang Qiu, Wen-Juan Li, Xi-Miao Ma, Xue-Hua Feng, Department of Thoracic Surgery, Haikou People's Hospital, Haikou Affiliated Hospital of Central South University Xiangya School of Medicine, Haikou 570208, Hainan Province, China

Corresponding author: Xue-Hua Feng, BSc, Associate Chief Nurse, Department of Thoracic Surgery, Haikou People's Hospital, Haikou Affiliated Hospital of Central South University Xiangya School of Medicine, No. 43 Renmin Avenue, Haidian Island, Haikou 570208, Hainan Province, China. fxh13700494704@163.com

Abstract

BACKGROUND

Lung cancer is a malignant tumor with high morbidity and mortality among cancers. Surgery is currently one of the primary methods of treating lung cancer. Although it can slow down the progression of the disease by removing the lesion, this invasive surgery inevitably damages the integrity of the patient's chest. Moreover, the patient's pulmonary function may have a low compensatory capacity after surgery, causing various respiratory diseases such as atelectasis, respiratory function decline, and even serious cardiovascular disease. All of these have great negative impacts on the surgical effect and the prognosis of patients. With the continuous exploration and development of nursing, continuous nursing and respiratory exercise nursing have been gradually applied in the nursing of patients after lung cancer surgery, and have achieved good nursing results.

AIM

To investigate the effect of continuous nursing combined with respiratory exercise nursing on the pulmonary function of postoperative patients with lung cancer.

METHODS

A total of 80 patients with lung cancer who underwent surgery in our hospital from January 2021 to December 2021 were selected as the study subjects. All subjects were randomly divided into the control group (n = 40 cases) and the experimental group (n = 40 cases). Patients with lung cancer in the control group were given conventional nursing after surgery, while the experimental group was given continuous nursing combined with respiratory exercise nursing based on conventional nursing. The recovery of pulmonary function and respiratory

symptoms was observed before and after 3 mo of intervention in both groups. The pulmonary function parameters, blood gas analysis, MD Anderson Symptom Inventory-lung cancer module (MDASI-LC) scores, incidence of pulmonary complications, and Morisky compliance scores were compared between the two groups before and after 3 mo of intervention.

RESULTS

There was no significant difference in pulmonary function and blood gas analysis between the two groups before intervention ($P > 0.05$). 3 mo after the intervention, the pulmonary function parameters in the experimental group (SpO_2, VC, MVV, FEV1, FEV1% pred, and FEV1/FVC) were higher than those in the control group, and the differences were statistically significant ($P < 0.05$). There was no significant difference in blood gas analysis between the two groups before intervention ($P > 0.05$). PaO_2 in the experimental group was significantly higher than that in the control group, and $PaCO_2$ was significantly lower than that in the control group 3 mo after the intervention. The difference had statistical significance ($P < 0.05$). 3 mo after the intervention, the MDASI score of respiratory symptoms in the experimental group was significantly lower than that in the control group ($P < 0.05$), and the incidence of pulmonary complications was lower than that in the control group ($P < 0.05$). In addition, the treatment compliance and nursing satisfaction of patients in the experimental group were higher than those in the control group, and the differences were statistically significant ($P < 0.05$).

CONCLUSION

Continuous nursing combined with respiratory exercise nursing can significantly accelerate the recovery of respiratory function in postoperative lung cancer patients, reduce the incidence of postoperative complications of lung cancer as well as improve the treatment compliance of patients.

Key Words: Postoperative lung cancer; Continuous nursing; Respiratory exercise nursing; Pulmonary function

Core Tip: Lung cancer is a malignant tumor disease with high morbidity and mortality among cancers. Continuous nursing and respiratory exercise nursing is a new nursing model, which can improve the long-term prognosis of patients with lung cancer and improve their life quality. Unfortunately, continuous nursing and respiratory exercise nursing for postoperative lung cancer patients are not widely studied. We collected 80 patients with lung cancer and observed the recovery of pulmonary function and respiratory symptoms after 3 mo of continuous nursing and respiratory exercise nursing. The results found that continuous nursing combined with respiratory exercise nursing could significantly accelerate the recovery of respiratory function, reduce the occurrence of postoperative complications of lung cancer, and improve patients' treatment compliance after lung cancer surgery.

Citation: Qiu QX, Li WJ, Ma XM, Feng XH. Effect of continuous nursing combined with respiratory exercise nursing on pulmonary function of postoperative patients with lung cancer. *World J Clin Cases* 2023; 11(6): 1330-1340

URL: https://www.wjgnet.com/2307-8960/full/v11/i6/1330.htm

DOI: https://dx.doi.org/10.12998/wjcc.v11.i6.1330

INTRODUCTION

Lung cancer is a malignant tumor originating from the bronchial mucosa and glands of the lung and is divided into small-cell lung cancer and non-small-cell lung cancer according to histological type[1]. At present, surgery, radiotherapy, and chemotherapy are the main methods for lung cancer treatment[2]. Surgical resection is the main method for the radical treatment of lung cancer. Meanwhile, perfect perioperative nursing is also particularly important[3]. Due to the damage to lung anatomy and physiology after lung cancer surgery, patients experience impaired gas exchange and hypoxemia, and some patients also experience complications such as respiratory failure[4,5]. Studies have shown that respiratory function exercise can improve postoperative pulmonary function and reduce the incidence of pulmonary complications in patients with lung cancer[6]. Therefore, early and adequate respiratory function exercise after lung cancer surgery is important for the recovery of pulmonary function and

improvement of hypoxemia.

Conventional nursing covers only nursing during hospitalization as well as health education for patients before discharge, and there is no patient nursing guidance and systematic follow-up after discharge. However, according to previous clinical experience, the completion rate of respiratory function exercise after discharge is generally low in patients after lung cancer surgery[7,8]. Therefore, it is necessary to improve patients' self-nursing ability at home. Continuous nursing is a new type of nursing model, which covers nursing services from hospital to family or society based on holistic nursing theory and humanistic nursing theory. It ensures the nursing quality of patients after discharge and improves the long-term prognosis of patients as well as their life quality[9-11]. By searching the literature, we found that studies have shown that the combination of continuous nursing and respiratory training has a better improvement effect on the life quality, mental health, and self-efficacy of lung cancer patients undergoing chemotherapy[12]. Based on this, we speculated that the application of continuous nursing combined with respiratory exercise nursing in postoperative lung cancer patients can also improve the respiratory function of patients and promote their rehabilitation to a certain extent. In this study, 80 patients with lung cancer undergoing surgery in our hospital were given continuous nursing combined with respiratory exercise nursing to observe the effect of this nursing model on the recovery of pulmonary function in patients after lung cancer surgery.

MATERIALS AND METHODS

General data

A total of 80 patients (49 males and 31 females) with lung cancer who underwent surgery in our hospital from January 2021 to December 2021 were selected as the study subjects. All patients and their families agreed to participate in the study and signed written informed consent. This study was approved by the Ethics Committee of Haikou People's Hospital. Inclusion criteria: (1) Patients diagnosed with primary lung cancer by bronchoscopy and pathological biopsy; (2) Patients with surgical indications, no mediastinal lymph node metastasis within stage II lung cancer[13] and expected survival of more than 6 mo; and (3) Patients with normal cognitive function and no mental illness. Exclusion criteria: (1) Patients receiving targeted therapy, chemotherapy, immunotherapy, and other treatments; (2) Patients with emotional instability, unable to cooperate with the treatment; (3) Patients with a history of thoracic or pulmonary surgery; (4) Patients with a lung infection, active tuberculosis, and severe COPD and other primary lung diseases; (5) Patients with other systemic diseases and dysfunction; and (6) Patients with incomplete clinical data. All patients were randomly divided into a control group (n = 40 cases) and an experimental group (n = 40 cases) according to different nursing models. There was no significant difference in general data such as gender, average age, body mass index, and medical history between the two groups (P > 0.05). The results are shown in Table 1.

Nursing intervention methods

Control group: Patients were treated with conventional nursing and health education after lung cancer surgery. Conventional health education, perioperative nursing, dietary guidance after discharge, medication guidance, and daily nursing guidance were given to the patients.

Experimental group: Continuous nursing combined with respiratory exercise nursing was adopted based on conventional nursing: (1) A continuous nursing team was established for patients after lung cancer surgery and systematic training was provided for all nurses; (2) Information files were established for discharged patients, including the patient's age, course of the disease, surgical methods, and other hospitalization information, as well as the patient's home address and contact information. Medical and nursing support was provided, and a personalized continuous nursing program was developed for discharged patients, including daily diet, medication, exercise, and disease review; (3) Implementation of continuous nursing. We implemented continuous nursing through weekly telephone follow-up and online instant communication. We guided patients to perform respiratory function exercises, encouraged patients to participate in social activities, and build their confidence in overcoming the disease; (4) Postural nursing: patients undergoing lobectomy were placed in the supine, left, or right lateral decubitus positions; patients undergoing segmentectomy or wedge resection were placed in the healthy lateral decubitus position as far as possible to promote dilatation of the lung tissue on the affected side, and those with bloody sputum or bronchial fistula should be placed in the affected lateral decubitus position; (5) Respiratory function exercise: (a) Pursed-lip breathing: Asked the patients to inhale with their noses, close their lips tightly, hold for 5 s after maximum deep inspiration, and then breathe slowly with their mouths like a whistle. Inspiratory time: Exhalation time is approximately 1:2; and (b) Abdominal breathing: Asked the patient to relax, place both hands on the abdomen, slowly distend the abdomen during inspiration, then spit out the gas with pursed-lip breathing, and depress the abdomen during expiration. Balloons can be used for blowing for 15 min 3-4 times a day; (6) Effective cough and expectoration exercise: Instructed patients to inhale deeply during cough and expectoration, hold their breath at the end of deep inspiration, and then expectorate deeply, which can

Table 1 Comparison of general data between the two groups

Clinical information	Test group, *n* = 40	Control group, *n* = 40	*t*/χ^2	*P* value
Average age (yr), mean ± SD	62.76 ± 10.43	62.18 ± 10.39	0.249	0.803
Gender, *n* (%)				
Male	24 (60)	25 (62.5)	0.053	0.818
Female	16 (40)	15 (38.5)		
Average disease duration (mo), mean ± SD	6.47 ± 1.32	63.6 ± 6.5	0.636	0.527
BMI (kg/m^2), mean ± SD	23.52 ± 3.68	23.47 ± 3.97	0.058	0.9536

BMI: Body mass index.

effectively promote sputum drainage; and (7) Nursing team and patient communication group were established for patients and their families to post daily breathing exercises and self-nursing logs. And the nursing plan was timely adjusted with the patient's self-nursing log. Also, timely guidance was given according to the changes in the patient's condition, and patients were well-reminded to come to the hospital for reexamination on time. Patients were guided to return to the hospital if any abnormal conditions occurred.

Observation index

Pulmonary function tests: Pulmonary function parameters were measured by professional physicians using (Master Screen Diffusion, JAEGER, Germany) advanced diffusion spirometry before and after 3 mo of intervention in both groups. Pulmonary function parameters included fingertip pulse oxygen saturation (SpO_2), vital capacity (VC), maximum ventilation (MVV), forced expiratory volume in the first second (FEV1), FEV1 percentage of predicted value (also known as FEV1% pred), and FEV percentage of vital capacity (FEV1/FVC). The data of 3 mo post-intervention were measured at patients' follow-up.

Blood gas analysis: The nursing staff drew blood from the patient's femoral artery, and the arterial blood gas analysis of the patients before and after 3 mo of intervention was detected by the laboratory personnel using an ABL90 blood gas analyzer (RADIOMETER, Denmark). Blood gas analysis parameters included PaO_2 and $PaCO_2$.

Respiratory symptoms: Nursing staff assessed the symptoms of the patients before and after 3 mo of intervention using the revised MD Anderson Symptom Inventory-lung cancer module (MDASI-LC) scale[14]. Items included cough, expectoration, hemoptysis, chest distress, and weight loss. Each item was scored on a scale of 0-10, where a score of 0 indicates the disappearance of symptoms, 1-3 indicates mild symptoms, 4-6 indicates moderate symptoms, 7-9 indicates severe symptoms, and 10 indicates extreme symptoms and severely affects life.

Complications: The number of patients with atelectasis, pulmonary infection, incision infection, wound bleeding, and respiratory failure within 3 mo after the intervention was recorded and counted in the two groups, and the total incidence was calculated.

Compliance: Morisky Medication Compliance Scale (MMAS-8) was used to assess the medication compliance of patients before nursing and 3 mo after nursing intervention[15]. MMAS-8 scale was full of 8 points. A score of 8 points was considered as good compliance, a score of 6-8 points as moderate compliance, and a score of fewer than 6 points as poor compliance.

Nursing satisfaction: Nursing satisfaction was assessed using a nursing satisfaction questionnaire designed by our hospital. The satisfaction survey was distributed by the nursing staff during the follow-up of the patients 3 mo after surgery. A total of 80 copies were distributed and 80 copies were recovered, with a recovery rate of 100% and an effective rate of 100%. The total score of the satisfaction questionnaire scale > 90 points indicates the patients were very satisfied; 80-90 points indicate satisfied; 60-79 points indicate fairly satisfied; < 60 points indicate dissatisfied. Satisfaction = (very satisfied cases + satisfied cases)/total cases × 100%.

Statistical analysis

Data were statistically analyzed using SPSS 19.0 software (SPSS Inc., Chicago, IL, United States). Measurement data were demonstrated as mean ± SD, and a *t*-test was used for comparison between the two groups. Enumeration data were demonstrated as *n* (%) and analyzed using the χ^2 test. $P < 0.05$ was

considered statistically significant.

RESULTS

Comparison of pulmonary function indexes between the two groups of patients

The changes in the indicators related to pulmonary function in the two groups were observed before and after the intervention with the two nursing programs. The results showed that there was no significant difference in the pulmonary function indexes between the two groups before the intervention ($P > 0.05$). During the follow-up visit after 3 mo of intervention, SpO_2 (%), VC (L), MVV (L/min), FEV1 (L), FEV1% pred (%), and FEV1/FVC (%) in the two groups were increased, and the increase of the above indicators in the experimental group was significantly higher than that in the control group ($P < 0.05$). This indicated that, compared with the conventional nursing program, continuous nursing combined with a respiratory exercise nursing intervention program can effectively promote the recovery of pulmonary function in postoperative lung cancer patients, which is conducive to the prognosis of patients, as shown in Table 2.

Comparison of blood gas analysis between the two groups

The changes in the indicators related to blood gas in the two groups were observed before and after the intervention with the two nursing programs. The results showed that the differences in PaO_2 (mmHg) and $PaCO_2$ (mmHg) between the two groups before the intervention were not statistically significant ($P > 0.05$). The PaO_2 in the experimental group was significantly higher than that in the control group and the $PaCO_2$ was significantly lower than that in the control group 3 mo after the intervention ($P < 0.05$). This indicated that, compared with the control group that only adopted conventional nursing, the patients in the experimental group with continuous nursing combined with respiratory exercise nursing intervention had better improvement in blood gas-related indicators, as shown in Table 3.

Comparison of MDASI scores of respiratory system symptoms between two groups

The changes in MDASI scores of respiratory symptoms in the two groups before and after the intervention of the two nursing programs were observed. There was no statistically significant difference can be found between the MDASI scores of respiratory symptoms in the two groups before the intervention ($P > 0.05$). The MDASI scores of cough, expectoration, hemoptysis, chest distress, and weight loss in the experimental group were significantly lower than those in the control group 3 mo after the intervention ($P < 0.05$) This suggested that the improvement level in all respiratory symptoms at 3 mo of intervention was better in patients who adopted continuous nursing combined with respiratory exercise nursing intervention than in those who adopted the conventional nursing program, as shown in Table 4.

Comparison of the incidence of pulmonary complications in the two groups

The incidence rates of surgical incision infection, surgical incision bleeding, pulmonary atelectasis, pulmonary infection, and respiratory failure were compared between the two groups 3 mo after the intervention of the two nursing programs. The incidence of atelectasis and pulmonary infection was significantly lower in the experimental group than in the control group, and the overall complication rate was also lower in the experimental group than in the control group (7.50% *vs* 22.50%, $P < 0.05$). This indicated that continuous nursing combined with respiratory exercise nursing significantly reduced the incidence of postoperative pulmonary complications compared with conventional nursing, as shown in Table 5.

Comparison of treatment compliance between two groups of patients

The level of patient compliance in the two groups before and after the intervention of the two nursing programs was observed. It was found that the difference between the percentage of patients with good, moderate, and poor compliance in the two groups before the intervention was not statistically significant ($P > 0.05$). The percentage of patients with good compliance in the experimental group was higher than that in the control group after 3 mo of the intervention ($P < 0.05$). This indicated that continuous nursing combined with the respiratory exercise nursing program can effectively improve the patient's treatment compliance, as shown in Table 6.

Comparison of nursing satisfaction between the two groups

The nursing satisfaction level between the two groups of patients after 3 mo of intervention by the two nursing programs was compared. The results showed that the number of very satisfied patients in the experimental group was higher than that in the control group, and the overall satisfaction rate was higher than that in the control group (95.00% *vs* 82.50%, $P < 0.05$). This indicated that continuous nursing combined with a respiratory exercise nursing program could significantly improve the nursing satisfaction of postoperative lung cancer patients, as shown in Table 7.

Table 2 Comparison of pulmonary function indicators between the two groups (mean ± SD)

Indicators	Time	Test group, *n* = 40	Control group, *n* = 40	*t* value	*P* value
SpO_2 (%)	Before the intervention	95.68 ± 10.26	95.35 ± 10.17	0.144	0.885
	3 mo after the intervention	98.86 ± 4.26	96.04 ± 3.57	3.209	0.002
VC (L)	Before the intervention	2.96 ± 0.36	2.91 ± 0.33	0.648	0.519
	3 mo after the intervention	3.64 ± 0.63	3.18 ± 0.46	3.567	< 0.001
MVV (L/min)	Before the intervention	83.74 ± 4.18	83.92 ± 4.24	0.191	0.849
	3 mo after the intervention	89.46 ± 7.56	85.02 ± 6.38	2.839	0.006
FEV1 (L)	Before the intervention	1.53 ± 0.24	1.57 ± 0.25	1.095	0.276
	3 mo after the intervention	2.56 ± 0.76	2.09 ± 0.53	3.208	0.002
FEV1% pred (%)	Before the intervention	61.27 ± 8.03	60.94 ± 7.42	0.191	0.849
	3 mo after the intervention	69.48 ± 9.35	63.56 ± 7.94	3.052	0.003
FEV1/FVC (%)	Before the intervention	67.22 ± 8.37	67.16 ± 8.24	0.032	0.974
	3 mo after the intervention	76.82 ± 10.46	70.05 ± 9.68	3.004	0.003

SpO_2: Oxygen saturation; VC: Vital capacity; MVV: Maximum ventilation; FEV1: Forced expiratory volume in the first second; FEV1% pred: FEV1 percentage of predicted value; FEV1/FVC: FEV1 percentage of vital capacity.

Table 3 Comparison of blood gas between the two groups (mean ± SD)

Indicators	Time	Test group, *n* = 40	Control group, *n* = 40	*t* value	*P* value
PaO_2 (mmHg)	Before the intervention	90.67 ± 11.24	90.32 ± 11.15	0.139	0.889
	3 mo after the intervention	98.45 ± 9.46	93.28 ± 8.89	2.524	0.013
$PaCO_2$ (mmHg)	Before the intervention	50.39 ± 5.27	50.12 ± 5.06	0.233	0.815
	3 mo after the intervention	42.85 ± 3.84	46.08 ± 4.38	3.507	< 0.001

DISCUSSION

According to a secondary analysis of global cancer statistics for 2020, lung cancer is the leading cause of cancer-related deaths among men and women in our country, accounting for 40% of lung cancer-related deaths worldwide[16]. Surgical resection is the best treatment option for lung cancer patients with surgical pointers[17]. However, the incidence of postoperative complications in lung cancer has been reported to be approximately 14%-40%[18]. One of the reasons is that lung cancer surgery changes the anatomy and physiological structure of the patient's lungs, which affects the patient's pulmonary ventilation and air exchange function, leading to serious complications such as pulmonary atelectasis and respiratory failure. Effective respiratory function exercise has a positive significance in improving a patient's pulmonary function and preventing complications. Continuous nursing is a targeted nursing program that enables patients to receive professional and effective nursing at home after discharge from the hospital[19]. As a new nursing model, continuous nursing extends nursing into the patient's home through follow-up visits, disease review, and modern communication, providing patients with timely, professional, and targeted nursing that is identical to that provided in the hospital[20]. In addition, continuous nursing solves the problem of transitioning patients from hospital to home, improves patients' self-care ability, reduces postoperative complications, and achieves good social benefits[21,22]. Therefore, it is important to implement continuous nursing for patients to prevent postoperative complications and improve patient nursing satisfaction.

In this study, we found that continuous nursing plus whole-course respiratory function exercise significantly increased pulmonary function parameters, such as SpO_2, VC, MVV, FEV1, FEV1% pred, FEV1/FVC. It also increased the arterial partial pressure of oxygen, decreased the arterial partial pressure of carbon dioxide, and had a lower MDASI score and incidence of pulmonary complications compared with conventional nursing. Zhou *et al*[23] pointed out that physical pulmonary rehabilitation (PMPR) was performed in 44 post-thoracoscopic lobectomy lung cancer patients, after which 3 (6.8%) patients had pulmonary atelectasis and 2 (4.5%) patients had pneumonia. The overall incidence of postoperative complications in lung cancer patients undergoing perioperative PMPR was 11.3%, which was higher than the 5% in this study. This further confirmed that continuous nursing combined with

Table 4 Comparison of MD Anderson Symptom Inventory scores between the two groups (mean ± SD)

Programs	Time	MDASI score		*t* value	*P* value
		Test group, *n* = 40	Control, group *n* = 40		
Cough	Before the intervention	7.28 ± 0.72	7.31 ± 0.74	0.183	0.854
	3 mo after the intervention	5.62 ± 0.53	6.54 ± 0.62	7.134	< 0.001
Expectoration	Before the intervention	7.43 ± 0.78	7.52 ± 0.79	0.512	0.609
	3 mo after the intervention	5.08 ± 0.52	6.29 ± 0.64	9.280	< 0.001
Hemoptysis	Before the intervention	4.63 ± 0.51	4.48 ± 0.49	1.341	0.183
	3 mo after the intervention	3.26 ± 0.36	4.17 ± 0.48	9.592	< 0.001
Chest distress	Before the intervention	5.89 ± 0.63	5.91 ± 0.66	0.138	0.890
	3 mo after the intervention	3.84 ± 0.39	4.52 ± 0.48	6.954	< 0.001
Weight loss	Before the intervention	4.62 ± 0.57	4.39 ± 0.54	1.853	0.067
	3 mo after the intervention	3.08 ± 0.31	3.78 ± 0.39	8.886	< 0.001
Total	Before the intervention	29.85 ± 3.21	29.61 ± 3.22	0.333	0.739
	3 mo after the intervention	20.88 ± 2.11	25.30 ± 2.61	8.329	< 0.001

MDASI: MD Anderson Symptom Inventory.

Table 5 Comparison of the incidence of pulmonary complications between the two groups, *n* (%)

Group	Surgical incision infection	Surgical incision bleeding	Atelectasis	Pulmonary infection	Respiratory failure	Overall incidence rate
Test group, *n* = 40	0 (0.00)	0 (0.00)	1 (2.50)	1 (2.50)	0 (0.00)	2 (5.00)
Control group, *n* = 40	0 (0.00)	0 (0.00)	3 (7.50)	6 (12.50)	0 (0.00)	9 (22.50)
χ^2						5.165
P value						0.023

Table 6 Comparison of treatment compliance between the two groups, *n* (%)

Group	Before the intervention			3 mo after the intervention		
	Good	Moderate	Poor	Good	Moderate	Poor
Test group, *n* = 40	6 (15.00)	28 (70.00)	6 (15.00)	24 (60.00)	11 (27.50)	5 (12.00)
Control group, *n* = 40	9 (22.50)	26 (65.00)	5 (12.00)	13 (32.50)	22 (55.00)	5 (12.00)
χ^2		0.765			6.937	
P value		0.682			0.031	

respiratory exercise nursing intervention was positive and effective in reducing postoperative complications and promoting postoperative recovery in patients with lung cancer. With the development of rehabilitation medicine, respiratory function exercise is considered to be an effective way to promote pulmonary rehabilitation. Active breathing exercise enhances the strength and endurance of respiratory muscles, improves the patient's pulmonary function and respiratory system function, and reduces the incidence of pulmonary complications while enhancing the patient's overall postoperative recovery[24]. In addition, effective breathing exercises increase pulmonary blood circulation, promote alveolar gas exchange, and improve pulmonary ventilation and hypoventilation[25]. Ko *et al*[26] found that 4-8 wk of exercise and bi-weekly continuous telephone communication guided by physiotherapists in patients with chronic obstructive pulmonary disease (COPD) reduced the frequency of acute exacerbations, promoted pulmonary rehabilitation as well as prolonged the time of readmission for acute COPD, which had a better control effect on the remission of COPD patients. Respiratory function exercise is a

Table 7 Comparison of nursing satisfaction between the two groups, *n* (%)

Group	Very satisfied	Satisfied	Fairly satisfied	Dissatisfied	Satisfaction rate
Test group, n = 40	26 (65.00)	12 (30.00)	2 (5.00)	0 (0.00)	38 (95.00)
Control group, n = 40	12 (30.00)	21 (52.50)	5 (12.00)	2 (5.00)	33 (82.50)
χ^2					7.825
P value					0.005

long-term process. However, after discharge from the hospital, most patients discontinue rehabilitation exercises and respiratory exercises due to various reasons such as fear of wound pain, depression, physical fatigue, and lack of professional respiratory exercise instruction. In this study, a complete nursing intervention group was established before the start of the intervention in continuous nursing combined with a respiratory exercise nursing program adopted by the patients in the experimental group. And all team members underwent standardized training to ensure the homogenization of the intervention. Continuous nursing was performed through postoperative visits, questionnaires, and online communication after patients were discharged from the hospital, maintaining the continuity, completeness, and integrity of nursing. The effect of respiratory exercise was evaluated, and the rehabilitation exercise was adjusted timely according to the changes of the patient's condition. What's more, effective cough and expectoration methods were instructed to patients to promote pulmonary sputum drainage and reduce the occurrence of pulmonary infection. Regular health education was given to patients to improve their perception of the importance of breathing exercises. Therefore, continuous breathing combined with respiratory exercise greatly improves pulmonary function, improves hypoxemia, and reduces the incidence of pulmonary symptoms and complications.

In addition, Morisky compliance and nursing satisfaction were better in the intervention group compared to the control group. Mei *et al*[27] performed whole-course high-quality nursing for 30 lung cancer patients who underwent surgery in the Department of Respiratory Medicine and found that this program could also effectively reduce the negative conditions of patients, lower the level of anxiety and depression, and improve patient compliance and satisfaction. This is somewhat similar to the conclusions of our study. Compared with the current continuous nursing combined with respiratory exercise, although both of them achieved positive nursing results, the whole-course nursing program focused on the physiological and psychological nursing of the patients, mostly on the nursing staff's initiative to provide psychological consultation and nursing services. While continuous nursing combined with respiratory exercise nursing in this study focused more on allowing patients and their families to actively participate in the nursing work with the help of nursing staff. It fundamentally promoted the recovery of pulmonary function in patients through scientific and efficient respiratory exercise, and also enhanced postoperative rehabilitation while taking into account the improvement of patients' participation, compliance, and satisfaction, which is more conducive to nurse-patient communication and nursing work. Poor patient compliance outside the hospital was associated with a lack of medical and nursing supervision as well as social support[28]. In the continuous nursing group, the patients were given the whole course of medication, diet, exercise guidance, and one-on-one health education during the home nursing after discharge, which enhanced the enthusiasm of patients for treatment and a good attitude toward life. A reasonable diet improves the nutritional status of patients and shortens the postoperative recovery time. It also strengthens communication between nurses and patients. Therefore, patients in the intervention group had higher treatment compliance and nursing satisfaction. In this study, the application of continuous nursing combined with respiratory function exercise in postoperative lung cancer patients achieved surprising results. This nursing model requires nursing team members to have excellent professional knowledge, the ability to deal with sudden complications as well as the ability to communicate friendly to patients after completing standardized training and assessment. In addition, the nursing members were also required to closely monitor various postoperative vital signs and rehabilitation indicators of patients, guide patients to perform respiratory function exercises as well as provide effective support and guarantee for maintaining a good health status of patients. However, there are still some limitations in this study. For example, the sample size is small and the postoperative observation time is short. It is uncertain whether results consistent with this study can be obtained after expanding the sample size and extending the postoperative observation time. In the subsequent study, we will further investigate and validate a larger sample size with a more rigorous study protocol.

CONCLUSION

In summary, continuous nursing combined with respiratory function exercise can effectively improve postoperative pulmonary function and PaO_2, reduce $PaCO_2$, and promote pulmonary function recovery

in patients. At the same time, it also reduces the occurrence of postoperative complications and improves patients' treatment compliance and nursing satisfaction. It is of great significance to the postoperative recovery of lung cancer.

ARTICLE HIGHLIGHTS

Research background

Lung cancer is the leading cause of cancer death. Therefore, it is particularly important to seek suitable nursing methods for the rehabilitation of lung cancer patients.

Research motivation

Resection surgery is the main treatment for lung cancer. Postoperative complications and mortality are mostly linked to respiratory failure consecutive to respiratory muscle overload. Respiratory movement plays an important role in lung cancer care, as well as the pulmonary rehabilitation.

Research objectives

This study aims to explore the effect of continuous nursing combined with respiratory exercise nursing on the recovery of lung function in patients with lung cancer after operation.

Research methods

Eighty patients with lung cancer were randomly divided into control group (n = 40 cases) and experimental group (n = 40 cases). The patients in the control group received routine nursing after operation, while the experimental group received continuous nursing combined with respiratory exercise nursing on the basis of routine nursing. Observe the recovery of pulmonary function and respiratory system symptoms of the two groups before and after the intervention for 3 mo.

Research results

After intervention, the nursing satisfaction of the study group was higher than that of the control group; PaO_2 in the study group was significantly higher than that in the control group; The MD Anderson Symptom Inventory score of respiratory symptoms in the study group was significantly lower than that in the control group; The treatment compliance and nursing satisfaction of patients in the study group were higher than those in the control group. The difference between the above studies was statistically significant ($P < 0.05$).

Research conclusions

Continuous nursing combined with respiratory exercise nursing can significantly accelerate the recovery of respiratory function of patients with lung cancer after surgery, reduce the incidence of postoperative complications of lung cancer, and improve the treatment compliance of patients.

Research perspectives

This study proves that continuous nursing combined with respiratory function exercise is of great significance for postoperative rehabilitation of lung cancer patients, which may provide a theoretical basis for postoperative treatment of lung cancer patients.

FOOTNOTES

Author contributions: Qiu QX and Feng XH were responsible for the concept and writing of the manuscript; Qiu QX and Li WJ analyzed the data; Li WJ and Ma XM were responsible for revising the paper; all authors have read and approved the final version of the manuscript.

Institutional review board statement: The study was reviewed and approved by Ethics Committee of the Haikou People's Hospital.

Informed consent statement: All study participants provided informed written consent prior to study enrollment.

Conflict-of-interest statement: All the authors report no relevant conflicts of interest for this article.

Data sharing statement: No additional data are available.

STROBE statement: The authors have read the STROBE Statement—checklist of items, and the manuscript was prepared and revised according to the STROBE Statement—checklist of items.

Country/Territory of origin: China

ORCID number: Qiong-Xiang Qiu 0000-0002-9910-738X; Xue-Hua Feng 0000-0002-8285-9825.

S-Editor: Gong ZM
L-Editor: A
P-Editor: Gong ZM

REFERENCES

1 **Nooreldeen R**, Bach H. Current and Future Development in Lung Cancer Diagnosis. *Int J Mol Sci* 2021; **22**: 8661 [PMID: 34445366 DOI: 10.3390/ijms22168661]
2 **Sihoe ADL**. Video-assisted thoracoscopic surgery as the gold standard for lung cancer surgery. *Respirology* 2020; **25** Suppl 2: 49-60 [PMID: 32734596 DOI: 10.1111/resp.13920]
3 **Jiang Q**, Zheng W, Chen B. Nursing postoperative lung cancer patients using continuous positive airway pressure treatment. *Am J Transl Res* 2021; **13**: 2962-2968 [PMID: 34017462]
4 **Krause-Sorio B**, An E, Aguila AP, Martinez F, Aysola RS, Macey PM. Inspiratory Muscle Training for Obstructive Sleep Apnea: Protocol Development and Feasibility of Home Practice by Sedentary Adults. *Front Physiol* 2021; **12**: 737493 [PMID: 34803729 DOI: 10.3389/fphys.2021.737493]
5 **Zantah M**, Dotan Y, Dass C, Zhao H, Marchetti N, Criner GJ. Acute exacerbations of COPD versus IPF in patients with combined pulmonary fibrosis and emphysema. *Respir Res* 2020; **21**: 164 [PMID: 32605574 DOI: 10.1186/s12931-020-01432-x]
6 **Wang YQ**, Liu X, Jia Y, Xie J. Impact of breathing exercises in subjects with lung cancer undergoing surgical resection: A systematic review and meta-analysis. *J Clin Nurs* 2019; **28**: 717-732 [PMID: 30357997 DOI: 10.1111/jocn.14696]
7 **Grant M**. Continuing Care. *Am J Nurs* 2019; **119**: 10 [PMID: 31449099 DOI: 10.1097/01.NAJ.0000580172.58441.7c]
8 **Jung B**, Cho KH, Lee DH, Kim S. The effects of continuity of care on hospital utilization in patients with knee osteoarthritis: analysis of Nationwide insurance data. *BMC Health Serv Res* 2018; **18**: 152 [PMID: 29499719 DOI: 10.1186/s12913-018-2951-y]
9 **Mahon MM**. Continuing Care. *Am J Nurs* 2019; **119**: 10 [PMID: 31449100 DOI: 10.1097/01.NAJ.0000580176.66064.d3]
10 **Tan X**, Xiong H, Gui S, Wan Y, Yan W, Wang D, Tong L, Zeng G. Effects of cognitive education on the perceived control and symptom distress of lung cancer patients receiving chemotherapy: A randomised controlled trial. *Eur J Cancer Care (Engl)* 2019; **28**: e13120 [PMID: 31184792 DOI: 10.1111/ecc.13120]
11 **Du J**. Effects of the Combination of Continuous Nursing Care and Breathing Exercises on Respiratory Function, Self-Efficacy, and Sleep Disorders in Patients with Lung Cancer Discharged from Hospital. *Contrast Media Mol Imaging* 2022; **2022**: 3807265 [PMID: 35965631 DOI: 10.1155/2022/3807265]
12 **Mou J**, Zheng S. Effects of ADOPT-Based Breathing Training Combined with Continuous Nursing on Quality of Life, Mental Health, and Self-Efficacy in Lung Cancer Patients Undergoing Chemotherapy: Based on a Retrospective Cohort Study. *Comput Math Methods Med* 2022; **2022**: 4164771 [PMID: 35495891 DOI: 10.1155/2022/4164771]
13 **Collins LG**, Haines C, Perkel R, Enck RE. Lung cancer: diagnosis and management. *Am Fam Physician* 2007; **75**: 56-63 [PMID: 17225705]
14 **Mendoza TR**, Wang XS, Lu C, Palos GR, Liao Z, Mobley GM, Kapoor S, Cleeland CS. Measuring the symptom burden of lung cancer: the validity and utility of the lung cancer module of the M. D. Anderson Symptom Inventory. *Oncologist* 2011; **16**: 217-227 [PMID: 21285393 DOI: 10.1634/theoncologist.2010-0193]
15 **Zhou C**, Tang J, Sun F, Huang L, Liu M, Kuang D. Continuity of Care plus Whole Process Psychological Intervention for Lung Cancer Patients undergoing Chemotherapy. *Evid Based Complement Alternat Med* 2022; **2022**: 4330059 [PMID: 35497926 DOI: 10.1155/2022/4330059]
16 **Cao W**, Chen HD, Yu YW, Li N, Chen WQ. Changing profiles of cancer burden worldwide and in China: a secondary analysis of the global cancer statistics 2020. *Chin Med J (Engl)* 2021; **134**: 783-791 [PMID: 33734139 DOI: 10.1097/CM9.0000000000001474]
17 **Hoy H**, Lynch T, Beck M. Surgical Treatment of Lung Cancer. *Crit Care Nurs Clin North Am* 2019; **31**: 303-313 [PMID: 31351552 DOI: 10.1016/j.cnc.2019.05.002]
18 **Efficace F**, Cartoni C, Niscola P, Tendas A, Meloni E, Scaramucci L, Soldati S, Brunetti GA, Marini MG, Mandelli F. Predicting survival in advanced hematologic malignancies: do patient-reported symptoms matter? *Eur J Haematol* 2012; **89**: 410-416 [PMID: 22985353 DOI: 10.1111/ejh.12004]
19 **Zhao L**, Shi P, Xiong X, Zeng J. Nonpharmacological interventions for cancer-related fatigue in lung cancer patients: A protocol for an evidence map of overview of a network meta-analysis of existing trials. *Medicine (Baltimore)* 2021; **100**: e26864 [PMID: 34397897 DOI: 10.1097/MD.0000000000026864]
20 **Fukuda S**, Nakajima K, Miyazaki Y, Takahashi T, Kurokawa Y, Yamasaki M, Miyata H, Takiguchi S, Mori M, Doki Y. Use of double-lumen peripherally inserted central catheters for safer perioperative management of esophageal cancer

patients. *J Vasc Access* 2015; **16**: 338-343 [PMID: 25907772 DOI: 10.5301/jva.5000382]

21 **Le J**, Grigorian A, Chen S, Kuo IJ, Fujitani RM, Kabutey NK. Novel endovascular technique for removal of adherent PICC. *J Vasc Access* 2016; **17**: e153-e155 [PMID: 27312764 DOI: 10.5301/jva.5000580]

22 **Lívia de Oliveira A**, Loures Mendes L, Pereira Netto M, Gonçalves Leite IC. Cross-cultural Adaptation and Validation of the Stoma Quality of Life Questionnaire for Patients With a Colostomy or Ileostomy in Brazil: A Cross-sectional Study. *Ostomy Wound Manage* 2017; **63**: 34-41 [PMID: 28570247]

23 **Zhou T**, Sun C. Effect of physical manipulation pulmonary rehabilitation on lung cancer patients after thoracoscopic lobectomy. *Thorac Cancer* 2022; **13**: 308-315 [PMID: 34882313 DOI: 10.1111/1759-7714.14225]

24 **Messaggi-Sartor M**, Marco E, Martínez-Téllez E, Rodriguez-Fuster A, Palomares C, Chiarella S, Muniesa JM, Orozco-Levi M, Barreiro E, Güell MR. Combined aerobic exercise and high-intensity respiratory muscle training in patients surgically treated for non-small cell lung cancer: a pilot randomized clinical trial. *Eur J Phys Rehabil Med* 2019; **55**: 113-122 [PMID: 29984565 DOI: 10.23736/S1973-9087.18.05156-0]

25 **Black L**. Lung Cancer Screening: Implementation of and Barriers to a Nurse Practitioner-Led Program. *Clin J Oncol Nurs* 2018; **22**: 601-605 [PMID: 30451993 DOI: 10.1188/18.CJON.601-605]

26 **Ko FW**, Tam W, Siu EHS, Chan KP, Ngai JC, Ng SS, Chan TO, Hui DS. Effect of short-course exercise training on the frequency of exacerbations and physical activity in patients with COPD: A randomized controlled trial. *Respirology* 2021; **26**: 72-79 [PMID: 32542906 DOI: 10.1111/resp.13872]

27 **Mei L**, Xu Y, Shi Q, Wu C. Application Effect and Prognosis of High-Quality Nursing in the Whole Process of Nursing in Lung Cancer Surgery. *Evid Based Complement Alternat Med* 2022; **2022**: 9491559 [PMID: 36034967 DOI: 10.1155/2022/9491559]

28 **Li L**, Xu F, Ye J. Effect of Family Participatory Nursing Model Based on WeChat Platform on Psychological Elasticity and Quality of Life of Patients with Lung Cancer. *Biomed Res Int* 2022; **2022**: 4704107 [PMID: 35578722 DOI: 10.1155/2022/4704107]

Published by **Baishideng Publishing Group Inc**
7041 Koll Center Parkway, Suite 160, Pleasanton, CA 94566, USA
Telephone: +1-925-3991568
E-mail: bpgoffice@wjgnet.com
Help Desk: https://www.f6publishing.com/helpdesk
https://www.wjgnet.com