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Impact of comprehensive nursing intervention on postoperative respiratory function, quality of life, and self-care in lung cancer patients undergoing radiotherapy and surgery

L. Ye[1#], J. Huang[2#], F. Qiu[3*]

[1]*Department of Respiratory Medicine, Second Affiliated Hospital of Hainan Medical University, Haikou 570311, Hainan Province, China*

[2]*Department of Nephrology, Second Affiliated Hospital of Hainan Medical University, Haikou 570311, Hainan Province, China*

[3]*First Area Department of Pediatrics, Second Affiliated Hospital of Hainan Medical University, Haikou 570311, Hainan Province, China*

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Corresponding author:
Feifei Qiu,
E-mail:
zhongshou4830010@163.com

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#These authors contributed equally to this work as co-first author.

ABSTRACT

Background: This study aimed to investigate the impact of a comprehensive nursing plan on post-radiooperative respiratory function, quality of life (QoL), and self-care ability in patients with lung cancer (LC) undergoing radiotherapy and surgery. ***Materials and Methods:*** A total of 100 LC patients undergoing radiotherapy and surgery were randomly assigned to either the Routine Nursing Care (RNC) group (n = 50) or the Comprehensive Nursing Care (CNC) group (n = 50). Various parameters, including respiratory function, visual analog scale (VAS), self-rating anxiety scale (SAS), self-rating depression scale (SDS), Pittsburgh sleep quality index (PSQI), exercise of self -care agency scale (ESCA), European Organization for Research and Treatment of Cancer (EORTC), and complication rate, were assessed. ***Results:*** Compared to the RNC group, the CNC group exhibited a significant decrease in respiratory frequency and an increase in oxygen saturation, maximal breathing capacity, minute ventilation volume, and forced expiratory volume in 1 s (FEV1) ($P < 0.05$). Additionally, CNC group scores for VAS, SAS, SDS, and PSQI were lower, while ESCA and EORTC scores were higher compared to the RNC group ($P<0.05$). Complication rates post-intervention was significantly lower in the CNC group (4.0%) compared to the RNC group (28.0%) ($P < 0.05$). ***Conclusion:*** In conclusion, comprehensive nursing intervention effectively improves post-radiotherapy operative respiratory function, anxiety, depression, and sleep quality. Furthermore, it enhances self-care ability and QoL in patients with LC undergoing radiotherapy and surgery while reducing the incidence of complications. These findings support the clinical application of comprehensive nursing care in this patient population.

INTRODUCTION

Lung cancer (LC) is a common respiratory disease, and its incidence has been increasing in recent years. The risk of LC in male is higher than that in female, and it shows a trend of younger age [1, 2]. Chemotherapy and surgical resection are often utilized for the therapy of LC in the clinic, and radiotherapy and Surgery is the main treatment mode for LC. Surgical treatment of LC can completely remove the primary LC lesions and metastatic lymph nodes or remove most of the lesions to create the conditions for other subsequent therapy [3]. However, surgical treatment is traumatic, and patients are prone to produce negative emotions such as tension and anxiety. In addition, factors such as postoperative pain have affected the patients' postoperative rehabilitation process and quality of life (QoL) [4].

Research findings indicate that patients undergoing chemotherapy commonly exhibit varied stress responses [5]. Additionally, they often experience adverse effects such as nausea, vomiting, and a diminished appetite [6]. These unfavorable reactions can lead to both physical and mental distress in patients, potentially resulting in reduced treatment compliance or, in extreme cases, treatment abandonment [7]. Moreover, studies highlight a connection between the effectiveness of chemotherapy and the subsequent quality of life, revealing a general decline in life quality for most patients' post-chemotherapy [8]. Particularly for patients with LC, serious adverse reactions are prevalent, compromising the efficacy of chemotherapy and contributing to unfavorable

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prognoses [9]. As a consequence, mitigating chemotherapy-induced adverse effects and enhancing overall quality of life are deemed crucial [10].Hence, improving the postoperative rehabilitation effects of patients undergoing LC radiotherapy and surgery and improving the QoL of patients have become the focus of attention of medical staff and their families in thoracic radiotherapy and Surgery.

Radiation therapy, as a common treatment modality for LC, is based on the principle of radiation, utilizing high-energy electromagnetic waves or particle beams to directly irradiate tumor tissues, thereby disrupting the DNA structure of tumor cells, inhibiting their growth and division, and achieving the purpose of suppressing tumor growth and spread. Its therapeutic principle is based on the direct and indirect damage effects of radiation on cells, wherein the direct effect refers to the direct action of radiation on the cell nucleus DNA molecules, causing DNA strand breaks and cell death; the indirect effect refers to the interaction of radiation with water molecules within the cell, generating reactive oxygen species, thereby leading to cell damage and death [11]. Despite the significant efficacy of radiation therapy in tumor treatment, it can also have a series of impacts on LC patients. It can lead to symptoms such as dyspnea, cough, chest pain, etc., seriously affecting their quality of life [12]. Furthermore, radiation therapy may also have negative effects on the psychological health of patients, such as anxiety, depression, fear, and other emotional issues, potentially affecting their treatment compliance and prognosis. Additionally, radiation therapy typically requires continuous treatment over several weeks or even months, necessitating frequent visits to the hospital for treatment, which imposes significant limitations and impacts on their lifestyle and daily activities, further exacerbating the physical and psychological burden on patients.

The comprehensive care model is an emerging care model with comprehensive and targeted characteristics that can meet the actual needs of patients to different degrees. Providing targeted care intervention for patients can improve the treatment effect and promote rehabilitation [13,14]. Ling *et al*. found that comprehensive high-quality nursing care during radiotherapy for liver cancer patients can improve adverse emotions, quality of life, and nursing satisfaction, and reduce adverse reactions [15]. In addition to enhancing individual quality of life, Zhang *et al*. also found that nursing interventions can effectively improve pulmonary function indicators (FVC) in patients undergoing liver cancer chemotherapy, showing significant improvement [16].

In this study, the influence of the comprehensive nursing mode on the postoperative QoL and self-care ability of patients with LC radiotherapy and Surgery was discussed. Patients undergoing LC radiotherapy and Surgery were included as the research object, and the effects of routine nursing and comprehensive nursing intervention on postoperative respiratory function, pain degree, sleep quality, self-care ability, QoL, and incidence of complications were compared. It was hoped to provide a reference for promoting the rehabilitation process of patients with LC radiotherapy and Surgery, improving the QoL of patients, and promoting the clinical application of a comprehensive nursing model.

MATERIALS AND METHODS

Study design

A total of 100 LC patients who underwent radiotherapy and surgical treatment at the Second Affiliated Hospital of Hainan Medical University from June 2022 to June 2023 were recruited. They were randomly assigned to either a routine nursing care (RNC) group or a comprehensive nursing care (CNC) group, with 50 cases in each group determined by a random number table.

Inclusion Criteria

i) Patients meeting the diagnostic criteria for LC outlined in the Guidelines for Clinical Diagnosis and Treatment of Lung Cancer by the Society of Oncology, Chinese Medical Association, and confirmed by pathological examination.
ii) Karnofsky (KPS) score greater than 60.
iii) Estimated survival period exceeding three months.
iv) Patients with clear consciousness, normal cognitive function, good compliance, and normal communication.
v) Patients with no history of radiotherapy or chemotherapy before operation.
vi) Analgesics were not used before operation.

Exclusion Criteria

i) Those with malignant tumors in other parts.
ii) Patients with an allergic constitution.
iii) Patients complicated with serious complications during the perioperative period.
iv) Patients complicated with severe liver, kidney, and heart dysfunction.
v) Patients with nervous system, immune system, or blood system dysfunction.
vi) Patients with cognitive dysfunction or previous mental history.

Ethical Approval

The study received approval from the Second Affiliated Hospital of Hainan Medical University Medical Ethics Committee, and participants provided signed informed consent.

Radiotherapy

Both groups of patients received radiotherapy

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after the surgical resection of the diagnosed LClesions. The postoperative radiotherapy clinical target volume (CTV) should include: (right lung) right hilum, below the carina, ipsilateral mediastinal lymph nodes; (left lung) left hilum, below the carina, mediastinal lymph nodes; for central lesions, CTV should include the residual end. Prophylactic irradiation of the supraclavicular area and other regions was not necessary. Expansion of 0.5-1.0 cm constituted the planning target volume (PTV). Radiotherapy was administered using a Primus linear accelerator (Siemens, Germany). The total dose of postoperative radiotherapy was 50 Gy, delivered in 2.0 Gy fractions, five times per week, with rest on Saturdays and Sundays. Local boost was administered to high-risk areas such as residual lesions, areas outside the lymph node capsule, or positive margins, to a dose of ≥60 Gy. Concurrent chemotherapy was administered to patients with locally advanced or metastatic disease, using cisplatin (approved by the China Food and Drug Administration, Yunnan Plant Pharmaceutical Co., Ltd., China) intravenously at a dose of 20 mg/m^2, once daily, for 5 consecutive days, repeated every 3 weeks. Prior to cisplatin infusion, patients received 2,000 mL of 5% glucose injection (approved by the China Food and Drug Administration, Jichuan Pharmaceutical Group Co., Ltd., China) via intravenous drip for 12 hours, followed by 3,000-3,500 mL of 5% glucose injection on the day of cisplatin infusion. After cisplatin infusion, hydration and diuresis should be maintained, with mannitol (approved by the China Food and Drug Administration, Hubei Tiansheng Pharmaceutical Co., Ltd., China) and furosemide injection (approved by the China Food and Drug Administration, Zhongjia Biotechnology Co., Ltd., China) administered to ensure a daily urine output of 2,000-3,000 mL and to maintain electrolyte balance, particularly potassium and magnesium levels, while monitoring renal function. Adequate hydration and diuresis should be continued for 2 days after cessation of cisplatin.

Nursing program intervention

Patients in the RNC group received RNC intervention with close observation of their condition and vital signs. Group health education was implemented to disseminate relevant knowledge on disease diagnosis and treatment, and patients were advised on perioperative drug use. Preoperative preparation measures were enhanced, and a postoperative diet was formulated based on patient recovery.

CNC group patients received the following additional nursing measures compared to RNC patients, specific nursing interventions are detailed in table 1.

Table 1. Nursing measures for CNC group patients.

Nursing measures	Specific explanation
Health education	Healthcare providers offer patients and their families relevant health knowledge regarding LC, correct misunderstandings, and patiently address questions. Regular assessments ensure the grasp of disease knowledge, and additional education is provided as needed to enhance understanding and foster a positive attitude towards the disease and treatment.
Psychological care	Psychological care is provided to patients by psychiatrists. Strategies such as muscle relaxation training and music therapy are employed to alleviate negative emotions.
Pain management	Patient pain levels are assessed using the visual analog scale (VAS) to guide physical therapy, including heat therapy and massage, to regulate metabolism, and provide analgesic medications when necessary.
Dietary care	Relevant food lists are provided, emphasizing high-calorie, high-protein, and high-vitamin intake before surgery, followed by a diet consisting mainly of light, easily digestible, and nutritious foods postoperatively.
Postoperative complication management	Fluid intake is strictly controlled, and fluid balance is monitored to prevent postoperative pulmonary edema and other complications. Regular chest X-rays and electrocardiogram monitoring are conducted to promptly detect and manage complications. Early postoperative pulmonary rehabilitation training and physical therapy are initiated to promote airway clearance and prevent lung infections and atelectasis.
Pulmonary rehabilitation training	Postoperative pulmonary rehabilitation treatments, including diaphragmatic breathing and nebulization therapy, are guided by nurses to improve lung capacity.
Sleep care	Patients are guided to establish stable sleep patterns and create a regular sleep schedule.
Other measures	Other measures include oral and skin care, smoking cessation counseling, providing a comfortable environment, and encouraging regular follow-up visits. Patients are encouraged to actively participate in rehabilitation and self-management to improve their quality of life and prognosis.

Outcome measurements

Respiratory function was measured using the Pony FX spirometer (COSMED, Italy). Trained medical staff performed the measurements on patients in a quiet state in the postoperative recovery room to ensure accuracy and consistency. Measurement parameters included respiratory rate (breaths/minute), blood oxygen saturation (%), maximum respiratory capacity (L/min), minute ventilation (L/min), and forced expiratory volume in one second (FEV1, L). Each patient underwent three consecutive measurements, and the average was taken as the final result. During the measurements, medical staff observed the patient's coordination and presence of any abnormal breathing patterns. If any

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abnormalities or inadequacies were detected during the measurements, they were repeated until accurate and reliable results were obtained.

Pain severity was assessed using the visual analog scale (VAS). Assessments were conducted at 6 hours, 24 hours, and 48 hours post-nursing intervention. Patients indicated their level of pain by moving a point along a ruler to the appropriate position, categorized as mild (1-3), moderate (4-6) or severe (7-10). Evaluations were performed by specially trained nursing staff in a quiet environment, with scores recorded for each assessment. Following assessment, healthcare providers discussed pain management plans with patients and provided appropriate analgesic treatment as needed.

Anxiety and depression levels were assessed using the self-rating anxiety scale (SAS) and the self-rating depression scale (SDS), respectively, before and after treatment. Patients completed the questionnaires in a quiet environment, and scores were assigned based on responses to various items in the questionnaire. The assessment results reflected the levels of anxiety and depression, with higher scores indicating more severe symptoms. Assessments were supervised and recorded by healthcare professionals with relevant qualifications and experience.

Sleep quality was evaluated using the Pittsburgh sleep quality index (PSQI) before and after treatment. Patients completed the PSQI questionnaire, which assessed sleep quality across seven domains, including sleep duration, sleep quality, sleep latency, sleep efficiency, sleep disturbances, medication use, and daytime dysfunction. The assessment results were interpreted and recorded by experienced healthcare professionals.

Self-care ability was assessed using the exercise of self-care agency scale (ESCA) before and after treatment. Patients responded to questions regarding self-care, including aspects such as diet, personal hygiene, exercise, and medication management. The assessment results reflected the patients' abilities and levels of self-care. The assessments were guided and recorded by trained nursing staff.

Quality of life was evaluated using the European Organization for Research and Treatment of Cancer (EORTC) questionnaire before and after treatment. Patients completed the EORTC-QOL-C30 questionnaire, which assessed various aspects of quality of life, including physical, psychological, social, and environmental factors. The assessment results were interpreted and recorded by healthcare professionals.

Complication records included the incidence of complications such as atelectasis or pulmonary infections. Healthcare providers regularly monitored changes in patients' conditions and recorded any occurrences of complications to facilitate timely intervention measures.

Statistical Analysis

SPSS Statistics 19.0(IBM, Armonk, USA) was used for statistical analysis. Count data were presented as frequencies or percentages, and the chi-square test was employed. Measurement data were expressed as mean ± standard deviation, and a t-test was conducted. A p-value < 0.05 was considered statistically significant.

RESULTS

General characteristic of patients

In the RNC group, there were 29 males and 21 females with a mean age of (60.23 ± 4.41) years. The distribution of histological types included 14 squamous cell carcinomas, 27 adenocarcinomas, 5 adenosquamous carcinomas, and 4 small cell carcinomas. The surgical procedures consisted of 32 cases of single lobectomy, 8 cases of bilateral lobectomy or pneumonectomy, 5 cases of wedge resection, and 5 cases of other extended resection. In the CNC group, there were 31 males and 19 females, with a mean age of (60.51 ± 5.02) years. Histological types included 16 squamous cell carcinomas, 23 adenocarcinomas, 4 adenosquamous carcinomas, and 7 small cell carcinomas. Surgical procedures included 30 cases of single lobectomy, 11 cases of bilateral lobectomy or pneumonectomy, 5 cases of wedge resection, and 4 cases of other extended resection (table 2).

Table 2. Characteristics of patients included into the study.

Variable	RNC (N=50)	CNC (N=50)	P-value
Age	60.23±4.41	60.51±5.02	0.767
Gender			
Male	29 (58%)	31 (62%)	0.684
Female	21 (42%)	19 (38%)	
Histological Type			
Squamous Cell Carcinoma	14 (28%)	16 (32%)	
Adenocarcinomas	27 (54%)	23 (46%)	
Adeno-squamous carcinomas	5 (10%)	4 (8%)	0.542
Small Cell Carcinoma	4 (8%)	7 (14%)	
Surgical Procedure			
Single Lobectomy	32 (64%)	30 (60%)	
Bilateral lobectomy or pneumonectomy	8 (16%)	11 (22%)	
Wedge resection	5 (10%)	5 (10%)	0.382
Other extended resections	5 (10%)	4 (8%)	

Comparison of Changes in Respiratory Function after Nursing Intervention

The differences in respiratory function indexes of patients undergoing LC Radiotherapy and Surgery after intervention with RNC and CNC plans were analyzed and compared in figure 1. Compared to the RNC group, patients in the CNC group exhibited a significant decrease in respiratory rate (RNC group: 17.48 breaths per minute, CNC group: 13.20 breaths per minute), while oxygen saturation (RNC group: 92.63%, CNC group: 95.64%), maximum respiratory capacity (RNC group: 50.91 L, CNC group: 69.55 L),

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minute ventilation (RNC group: 2.48 L, CNC group: 2.88 L), and forced expiratory volume in one second (FEV1) (RNC group: 1.04 L, CNC group: 1.29 L) significantly increased (P < 0.05).

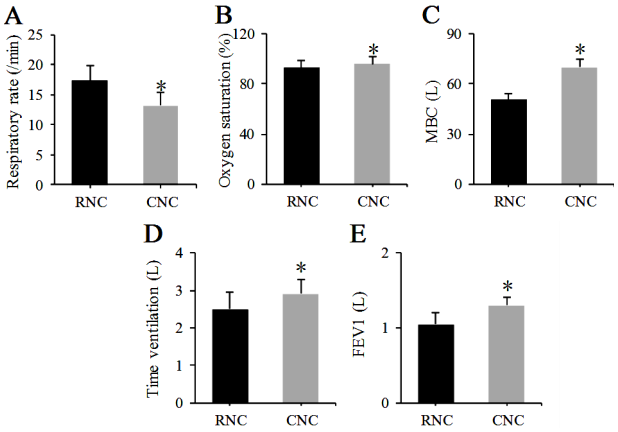

Figure 1. Contrast of respiratory function of patients after intervention. (**A** is respiratory rate, **B** is blood oxygen saturation, **C** is the maximum breathing capacity (MBC), **D** is the time ventilation, **E** is FEV1, *P < 0.05 vs. RNC group).

Comparison Analysis of Pain in Patients before and after Nursing Intervention

The differences in VAS scores of pain severity of patients undergoing LC radiotherapy and radiotherapy and surgery at 6h, 24h, and 48h after the intervention of RNC and CNC plan were compared. Figure 2 shows that the VAS scores of patients in different groups increased slightly with prolonged postoperative time. Compared to the RNC group, patients in the CNC group exhibited significant reductions in VAS scores at 6 hours, 24 hours and 48 hours' post-intervention, reaching 1.86, 3.01 and 3.03, respectively (P < 0.05).

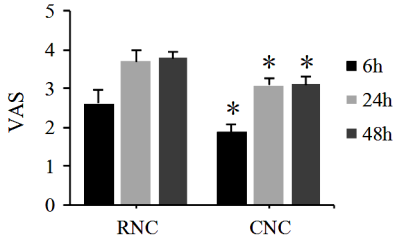

Figure 2. Contrast of pain degree after nursing intervention (*P < 0.05 vs RNC group).

Comparison Analysis of Anxiety and Depression in Patients before and after Nursing Intervention

The differences in the SAS scale for anxiety disorder and SDS scale for depression disorder in patients with LC before and after intervention with RNC and CNC plans were analyzed and compared (figure 3). Before the intervention, no considerable difference was suggested in SAS and SDS scale scores between the RNC and CNC groups (P > 0.05). Compared to before intervention, the SAS scores of patients in the RNC and CNC groups decreased from 58.68 to 48.85 and from 59.02 to 40.00, respectively, while the SDS scores decreased from 58.68 to 51.15 and from 58.69 to 41.31, respectively. The comparison within the CNC group showed statistical significance (P < 0.05). The scores of patients in the CNC group were significantly lower than those in the RNC group (P < 0.05).

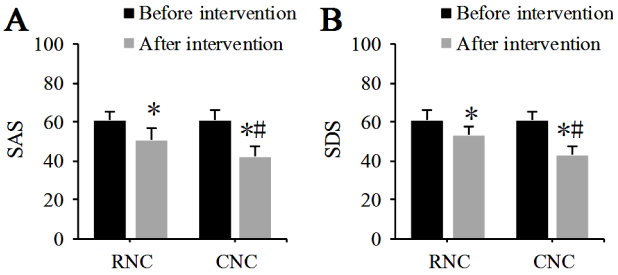

Figure 3. Contrast of anxiety and depression disorder before and after intervention. (**A:** SAS score for anxiety, **B:** SDS score for depression, *P < 0.05 vs. the same group before intervention, #P < 0.05 vs. RNC group).

The comparative analysis of sleep quality in patients before and after nursing intervention

The differences in PSQI scores of sleep quality of LC patients undergoing radiotherapy and Surgery before and after the intervention of RNC and CNC were analyzed and compared (figure 4). Before the intervention, no considerable difference was suggested in PSQI scores between the RNC and CNC groups (P > 0.05). Compared to pre-intervention scores, the PSQI scores of patients in the RNC group decreased from 15.83 to 8.40 and those in the CNC group decreased from 16.39 to 4.28 with statistically significant differences observed within the CNC group (P < 0.05). Furthermore, the scores of patients in the CNC group were significantly lower than those in the RNC group (P < 0.05).

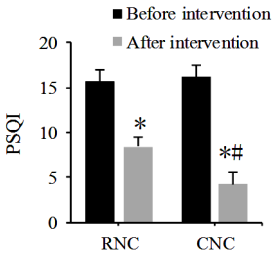

Figure 4. Contrast of sleep quality before and after nursing intervention. (*P < 0.05 vs the same group before intervention, #P < 0.05 vs. RNC group).

Comparative analysis of self-care abilities in patients before and after nursing intervention

The differences in the ESCA scale scores of the self-care ability of LC patients before and after intervention with RNC and CNC plans were analyzed and compared (figure 5). Before the intervention, no considerable difference was suggested in the scores of each dimension of the ESCA scale between patients in the RNC and CNC groups (P > 0.05). Compared to the scores before intervention, patients in both the RNC and CNC groups showed significant increases in dimensions such as disease knowledge (RNC group: 21.14, CNC group: 31.72), self-responsibility (RNC group: 41.23, CNC group: 49.16), self-care ability (RNC group: 24.05, CNC group: 35.68), and self-concept (RNC group: 20.35, CNC group: 27.22) on the ESCA scale. Moreover, the CNC group exhibited significantly higher scores than the RNC group (P<0.05).

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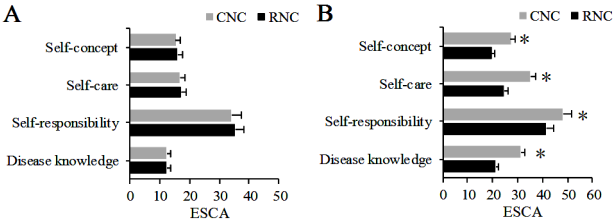

Figure 5. Contrast of patients' self-care ability before and after nursing intervention. (**A:** ESCA score before nursing intervention, **B:** ESCA score after nursing intervention, *P < 0.05 vs RNC group).

Comparison analysis of patient quality of life before and after nursing intervention

The differences in the scores of the EORTC scale for QoL of patients with LC before and after intervention with routine care and comprehensive care were analyzed and compared (figure 6). Before intervention, no considerable difference was suggested in the scores of each dimension in the EORTC scale between the patients in the RNC and CNC groups ($P > 0.05$). Relative to the scores before intervention, the scores of each dimension in the EORTC scale of patients in the RNC and CNC groups were markedly increased. Compared to the RNC group, patients in the CNC group exhibited significantly increased scores in the EORTC questionnaire for post-intervention functional aspects, including physical functioning (RNC group: 70.74, CNC group: 85.15), social functioning (RNC group: 65.94, CNC group: 81.22), limb function (RNC group: 72.05, CNC group: 84.27), psychological status (RNC group: 59.82, CNC group: 80.78), pain intensity (RNC group: 68.12, CNC group: 82.09), energy level (RNC group: 75.10, CNC group: 83.40), and bodily dimensions (RNC group: 65.06, CNC group: 75.10), with CNC group scores significantly higher than those of the RNC group ($P < 0.05$).

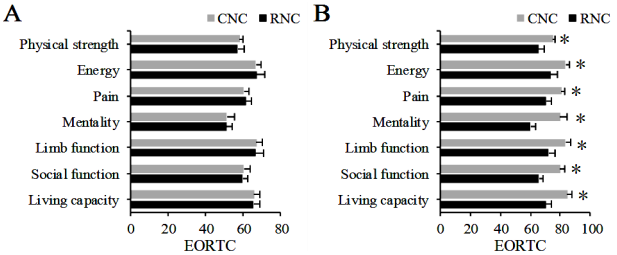

Figure 6. Contrast of patients' QoL before and after intervention. (**A:** EORTC score before nursing intervention, **B:** EORTC score after nursing intervention, *P < 0.05 vs RNC group.)

Adverse events

The differences in the complication rates of LC radiotherapy and Surgery patients after the intervention of RNC and CNC plans were analyzed and compared. Nine cases of atelectasis and five cases of pulmonary infection were found in the patients in RNC group after the operation, with a total complication rate of 28.0%. In CNC group, there were two cases of atelectasis and zero cases of pulmonary infection after the operation, and the total complication rate was 4.0%. Relative to RNC group, the incidence of postoperative complications in CNC group was substantially reduced ($P < 0.05$).

DISCUSSION

LC is a clinically malignant tumor of the respiratory system, and there are many precipitating factors for this disease. Smoking, heredity, ionizing radiation, and previous pulmonary infection are all risk factors for LC [17,18]. Radical resection of LC is the main treatment for LC and the only treatment that can cure it. However, surgical trauma, postoperative pain, and fear of disease seriously affect the mental health and sleep quality of patients, decrease their confidence in postoperative rehabilitation, affect the surgical effect, and reduce their QoL, ultimately resulting in the deterioration of the disease [19,20]. Hence, taking effective nursing measures is very imperative for improving the prognosis of patients undergoing LC radiotherapy and Surgery.

The CNC model is an effective supplement and improvement on the basis of traditional nursing measures, in the hope of improving the rehabilitation effect of patients through all-round, standardized and targeted nursing intervention, and finally providing the guarantee for the surgical effect and postoperative rehabilitation process, as well as improving the QoL and prognosis of patients [21-23]. In this study, the effects of RNC intervention and CNC intervention were compared regarding the postoperative respiratory function of LC patients undergoing radiotherapy and Surgery. It was found that after CNC intervention, the respiratory frequency of patients was substantially reduced, while oxygen saturation, maximal breathing capacity, minute ventilation volume, and FEV1 level were increasedsame as the study by Miao *et al.* [24] Pulmonary fibrosis and substantive malignancy are pathological changes of LC, and most patients show dyspnea or respiratory dysfunction [25]. The CNC mode includes lung rehabilitation training, and effective respiratory function training can promote the rehabilitation of LC patients and improve their postoperative respiratory function [26].

Radiotherapy and Surgery is the first choice for the treatment of LC, but it has a certain risk. Factors such as surgical trauma and postoperative pain will lead to negative emotions such as tension, fear, and anxiety in patients, affecting the sleep quality of patients, which are not conducive to postoperative rehabilitation [27]. This study found that the VAS for pain, SAS for anxiety, SDS for depression, and PSQI for sleep quality of patients undergoing LC radiotherapy and Surgery after routine care and comprehensive care were dramatically inferior to those before intervention. The VAS for pain, SAS for anxiety, SDS

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for depression, and PSQI for sleep quality of patients after comprehensive care intervention were dramatically inferior to those after routine care, which is align with results of study by Sun *et al*. [28].

Hence, health education in the comprehensive care model can help patients correctly face the disease and establish a positive attitude toward the treatment. In the comprehensive care mode, psychological care can help patients relieve bad emotions and reduce the psychological and physical stress responses caused by the operation through family-social support, muscle relaxation training, and music therapy. Surgical trauma and inflammatory reactions are the main causes of postoperative pain in patients undergoing radiotherapy and Surgery, while pain causes immunosuppression and increases the risk of conscienceless vascular time [29]. Targeted pain care can effectively reduce the severity of postoperative pain in patients, facilitate postoperative rehabilitation, and improve the sleep quality of patients [30]. Psychological care can also effectively alleviate the perioperative tension, anxiety, fear, and other adverse psychology of patients, improve the pain threshold, and reduce the degree of postoperative pain [31]. This result indicated that patients undergoing LC radiotherapy and Surgery receiving CNC intervention could effectively improve postoperative pain, anxiety, depression, and negative emotions, improve sleep quality, and facilitate postoperative rehabilitation.

Subsequently, the effects of pre- and post-nursing care on the self-care ability and QoL of patients undergoing LC radiotherapy and Surgery were evaluated. It was revealed that the ESCA scores of self -care ability and EORTC scores of QoL of LC patients undergoing radiotherapy and Surgery after routine care and comprehensive care were greatly superior to those before intervention, and the ESCA scores of self-care ability and EORTC scores of QoL of patients after comprehensive care intervention were greatly superior to those after routine care. The results of our study is align with the study by Miao *et al*. [24]. In their study following the intervention, there was an increase in the scores of the ESCA Scale and European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-Core 30 (EORTC QLQ-C30) in both groups. However, the group received high quality nursing including health education, psychological nursing, diet intervention, pain nursing and complication nursing exhibited higher scores than the control group for both scales.

After health education, knowledge mastery tests can help patients become familiar with and master the relevant knowledge of disease and nursing and enhance patients' confidence and ability in self-management. Comprehensive care can provide standardized and CNC guidance for patients, change the concept of patients being taken care of, play a subjective initiative, and enhance the consciousness of self-care, which in turn improves the self-care ability and QoL of patients undergoing radiotherapy and Surgery [32]. Finally, this study indicated that the probability of postoperative complications such as atelectasis and pulmonary infection in patients with LC after comprehensive care was dramatically inferior to that after routine care. This result suggested that effective and reasonable nursing measures could obviously control the incidence of atelectasis or pulmonary infection in patients undergoing thoracic radiotherapy and Surgery and facilitate the patients' postoperative rehabilitation.

CONCLUSION

Comprehensive nursing intervention for patients undergoing LC radiotherapy and Surgery can improve postoperative respiratory function, pain, anxiety, depression, and other negative emotions, improve sleep quality, reduce the incidence of postoperative complications, improve patients' self-care ability, and improve QoL. Nevertheless, this study only analyzed the short-term impact of CNC intervention on LC patients undergoing radiotherapy and Surgery, and more clinical data need to be included to analyze the impact on patients' postoperative rehabilitation and long-term prognosis. In conclusion, this study can provide a reference for improving the QoL and prognosis of patients with LC after radiotherapy and Surgery.

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Conflicts of interests: None

Ethical consideration: The study received approval from the Second Affiliated Hospital of Hainan Medical University Medical Ethics Committee, and participants provided signed informed consent.

Author contribution: L.Y.: Conceptualization, investigation, data curation, writing - original draft preparation.J.H.: Methodology, formal analysis, visualization, writing - review & editing. F.Q.: Software, validation, resources, supervision.

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