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Original Article

Comprehensive nursing intervention decreases the occurrence rate of patient's complications during chemotherapy for patients with lung cancer

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Abstract: Objective: To compare the application value of a comprehensive nursing intervention and a conventional nursing protocol during chemotherapy for patients with lung cancer and assess its influence on patient respiratory function. Method: We divided 208 patients who received lung cancer chemotherapy into a comprehensive group and conventional group, Clinical data, adverse reactions, quality of life assessment (EORTC QLQ-C30) results, and respiratory function of patients and their satisfaction with nursing and awareness rate of attentions were compared. Results: Satisfaction with nursing was significantly higher in the comprehensive group (92.13%) than in the conventional group (61.73%) ($P < 0.01$). The occurrence rate of complications in the comprehensive group was significantly lower than that in the conventional group (35.43% vs. 69.14%, respectively) ($P < 0.01$). The awareness rate of attentions in the comprehensive groups (85.04%) was significantly higher than that in the conventional group (66.67%) ($P < 0.01$). The average EORTC QLQ-C30 score was 82.85 ± 8.22 points in the comprehensive group, which was significantly different from 67.37 ± 10.25 points in the conventional group ($P < 0.01$); this indicated that the results were significantly better in the comprehensive group than in the conventional group. Conclusions: A comprehensive nursing intervention protocol during chemotherapy for patients with lung cancer leads to patients' higher satisfaction with nursing, effectively decreases the occurrence rate of patient's complications, and enhances the recovery of patient respiratory function.

Keywords: Comprehensive nursing, lung cancer, chemotherapy, respiratory function

Introduction

Lung cancer is the most common primary lung malignancy, and it mostly originates in the bronchiolar epithelium [1]. The worldwide occurrence rate of lung cancer reached 26.85% in 2015 according to the statistics of Brahmer et al. [2], making it the second most common malignancy [3]. The occurrence rate of lung cancer in regions with developed industries and larger population bases, such as England and China, is significantly higher than that in other regions [4]. Moreover, the results of multiple studies conducted at home and abroad [5-7] reveal that the occurrence rate of lung cancer has been increasing yearly since 2010, along with increases in the number of motor vehicles and factories, and the number of patients from the city who develop lung cancer is significantly higher than the number of patients from rural areas.

At present, the pathogenesis of lung cancer is unknown, while lung cancer has the highest fatality rate of all malignancies [8]. The 5-year survival rate of patients with lung cancer is not higher than 35.82% according to Fehrenbacher et al. [9], and the death rate increases linearly each year. Lung cancer is always a popular focus of clinical research owing to its high morbidity and high death rate. As of yet, there have been no breakthrough research results regarding treatment of lung cancer, and surgical resection in combination with chemotherapy remains the main curative approach. Fernandez et al. [10] reported that the surgical removal of lesions can be completed in about 82.24% of patients, and normal lung tissues in the radia-

Table 1. Comparison of clinical data between two groups of patients [n (%)]

	Comprehensive Group (n = 127)	Conventional Group (n = 81)	X^2 or t	P
Age	52.36 ± 8.43	53.08 ± 9.61	0.57	0.57
Body weight (KG)	79.34 ± 11.52	78.69 ± 12.87	0.38	0.71
Sex			0.20	0.66
Male	96 (75.59)	59 (72.84)		
Female	31 (24.41)	22 (27.16)		
Pathological location			0.24	0.63
Central type	49 (38.58)	34 (41.98)		
Surrounding type	78 (61.42)	47 (58.02)		
Pathological type			0.43	0.51
Squamous cell carcinoma	71 (55.91)	49 (60.49)		
Adenocarcinoma	56 (44.09)	32 (38.51)		
Pathological stage			0.55	0.46
I~II	39 (30.71)	21 (25.93)		
III~IV	88 (69.29)	60 (74.07)		
Place of residence			0.76	0.38
Urban	15 (11.81)	13 (16.05)		
Country	112 (88.19)	68 (83.95)		
Smoking			< 0.01	0.94
Yes	6 (4.72)	4 (4.94)		
No	121 (95.28)	77 (95.0600)		

tion field can easily exhibit a series of inflammatory responses owing to radiation injury during postoperative chemotherapy [11]. Breathing disorders and lung function depression may occur in the case of slight injury, and serious extensive pulmonary fibrosis that directly endangers the life of patients may occur in the case of heavy injury [12]. However, the findings of Zhou et al. [13] show that the special nursing protocol plays an important role in the avoidance of secondary injury to patients with lung cancer caused by exposure to radiation during chemotherapy. At present, the application of a nursing protocol to patients with lung cancer at home and abroad remains controversial, whereas the study of Shin et al. [14] proved that the application of a comprehensive nursing intervention protocol during chemotherapy for patients with esophageal cancer effectively improves patient prognosis.

Therefore, we hypothesize that the application value of a comprehensive nursing intervention during chemotherapy for patients with lung cancer was excellent. In the present study, patients who received lung cancer chemotherapy and were treated with a comprehensive nursing intervention were retrospectively examined to provide clinically effective references and guidance.

Materials and methods

General information

Patients who received lung cancer chemotherapy and were admitted to Zhucheng People's Hospital were selected as study subjects and were retrospectively examined. Inclusion criteria were as follows: diagnosis of lung cancer by biopsy at pathology department of our hospital; receipt of chemotherapy at our hospital after diagnosis; no history of chemotherapy; complete case records available; and age between 20 and 65 years. Exclusion criteria were as follows: serious cardiopulmonary and renal dysfunction; nerve dysfunction; cardiocerebrovascular disease; other cancers; immune disease; infectious disease; physical disability; long-term bedridden state; gestational state; poor compliance; and transfer to other hospital midway through treatment period. After screening, 208 patients were included in the study; these patients were divided into a comprehensive group (127 patients, receiving comprehensive nursing intervention protocol) and a conventional group (81 patients, receiving conventional nursing protocol) based on the different nursing protocols practiced during chemotherapy at our hospital.

Method

The nursing interventions in both groups of patients were performed strictly in accordance with the Guide for Nursing 2015 [15]. Contents of the nursing intervention in the conventional group included disease observation, medication guide, and monitoring of vital signs. Comprehensive nursing intervention was performed in the comprehensive group based on

Table 2. Comparison of nursing satisfaction between two groups of patients [n (%)]

	Comprehensive Group (n = 127)	Conventional Group (n = 81)	X^2	P
Excellent	86 (67.72)	11 (13.58)		
Good	31 (24.41)	39 (48.15)		
General	7 (5.51)	19 (23.46)		
Difference	3 (2.36)	12 (14.81)		
Excellent rate (%)	92.13	61.73	28.88	< 0.01

Table 3. Comparison of adverse reactions in two groups of patients [n (%)]

	Comprehensive Group (n = 127)	Conventional Group (n = 81)	X^2	P
Gastrointestinal reaction	34 (26.77)	49 (60.49)		
Allergic reaction	29 (22.83)	42 (51.85)		
Mucosal injury	18 (14.17)	39 (48.15)		
Myelosup-pression	16 (12.60)	30 (37.04)		
Occurrence rate (%)	35.43	69.14	22.49	< 0.01

the protocol of the conventional group, and the contents included the requirement to communicate further with patients, formulate personalized psychological counseling and health guidance, carefully and patiently explain disease-related knowledge and relevant information during chemotherapy to patients, encourage patients to actively cooperate with the treatment, and channel the negative emotions of patients. A reasonable and healthy diet was formulated according to the personal physiological and dietary habits of patients, and crude fiber foods with high protein and high fiber contents were usually used. For patients experiencing pain, shifting attention method was used, and analgesics were properly used on the premise of diagnosis and permission of a doctor. Nurses closely monitored the adverse reactions and vomiting of patients that resulted owing to chemotherapy; patients were intravenously infused with 20 mg of metoclopramide and 100 mL of 5% glucose solution 1 h before each chemotherapy session and were intravenously injected with 8 mg of ondansetron within 4-6 h after chemotherapy. Forearm veins were the first choice for puncture, with a small amount of normal saline administered first and the chemotherapy drug injected after completion of the puncture. A chemotherapy regimen via a venous indwelling needle could be selected after the doctor communicated with patients and their family members. Nurses would also remind the patients to take a timely vitamin B supplement after each chemotherapy session and if myelosuppression occurred, chemotherapy was stopped immediately. When the level of white blood cells return to normal and be stable, chemotherapy was continued. Nurses would help and guide patients in simple rehabilitation training and would provide corresponding books, music, etc. to assist in patient relaxation.

Observation index

Clinical data of patients (such as age, course of disease, and pathological stage); general index: including satisfaction with nursing (using anonymity scoring system, in which 90 points and above were judged as excellent, 81-89 points were judged as good, 61-80 points were judged as general, and less than 60 points were judged as poor; excellent rate of satisfaction with nursing = scoring as excellent + scoring as good); awareness rate of attentions; adverse reactions (gastrointestinal reaction, allergic reaction, mucosal injury, bone marrow transplantation, etc., number of patients with one or more complications); quality of life assessment (using European Organization for Research and Treatment of Cancer [EORTC] QLQ-C30 [16] for scoring; the scoring contents included physical function, role function, cognitive function, emotional function, and social function, and the higher the points, the better the situations); and patient's respiratory function: draw 2 mL of radial artery blood from patients before chemotherapy (T1), 7 days after chemotherapy (T2), 14 days after chemotherapy (T3), and 21 days after chemotherapy (T4), analyze the alveolar-arterial oxygen tension difference ($A\text{-}aDO_2$) and intrapulmonary shunt (Qs/Qt) by blood gas analyzer, and test the vital capacity (VC%) and maximum voluntary ventilation (MVV%) of patients.

Statistical analysis

SPSS 22.0 was used to analyze and handle the data; measurement data, such as age, body weight, and quality of life score, were repre-

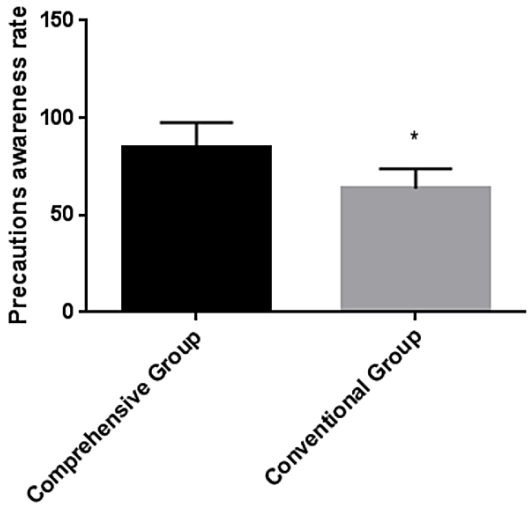

Figure 1. Comparison of the awareness rate of the two groups of patients' attention. *represents P < 0.05 compared with the integrated group. Awareness in the comprehensive group is significantly higher than that in the conventional group.

sented with (X ± S), and the t-test was used for comparison among groups. Enumeration data, such as patient's sex, adverse reactions, and awareness rate of attentions, were presented in percentage (%), and the chi-square test was used for comparison among groups.

Results

Comparison of general information

To obtain accurate and effective experiment results, the age, body weight, course of disease, sex, pathological type, pathological stage, place of residence, smoking history, etc. of patients were compared between the two groups. No significant differences were observed (P > 0.05), demonstrating that the patients in the two groups were comparable. See **Table 1** for details.

Comparison of general index

The percentages of patients who were satisfied with nursing, judged as excellent, good, general, and poor, were 67.72% (86 patients), 24.41% (31 patients), 5.51% (7 patients), and 2.36% (3 patients), respectively, in the comprehensive group and 13.58% (11 patients), 48.15% (39 patients), 23.46% (19 patients), and 14.81% (12 patients), respectively, in the conventional group. Satisfaction with nursing was significantly higher in the comprehensive group (92.13%) than in the conventional group (61.73%) (P < 0.01) (**Table 2**).

Regarding complications, gastrointestinal reaction, allergic reaction, mucosal injury, and myelosuppression occurred in 36.77% (34 patients), 22.83% (29 patients), 14.17% (18 patients), and 12.60% (16 patients) of patients, respectively, in the comprehensive group and in 60.49% (49 patients), 51.85% (42 patients), 48.15% (39 patients), and 37.04% (30 patients) of patients, respectively, in the conventional group. The occurrence rate of complications in patients in the comprehensive group (35.43%) was significantly lower than that in the conventional group (69.14%) (P < 0.01) (**Table 3**).

Moreover, the awareness rate of attentions of patients in the comprehensive group (85.04%) was significantly higher than that in the conventional group (66.67%) (P < 0.01) (**Figure 1**).

Comparison of EORTC QLQ-C30

The physical, role, cognitive, emotional, and social functions were given scores of 81.26 ± 8.28, 79.57 ± 6.65, 85.18 ± 9.08, 81.95 ± 9.25, and 86.34 ± 7.85 points, respectively, in the comprehensive group; these scores were significantly better than those in the conventional group (P < 0.01). The average EORTC QLQ-C30 score in the comprehensive group was 82.85 ± 8.22 points, which was statistically significantly higher than the 67.37 ± 10.25 points in the conventional group (P < 0.01). See **Table 4** for details.

Comparison of respiratory function

The A-aDO_2 of patients at T1, T2, T3, and T4 was 184.64 ± 36.87, 126.46 ± 29.54, 107.26 ± 28.64, and 72.62 ± 22.34, respectively, in the comprehensive group and 184.82 ± 40.57, 176.25 ± 36.87, 172.36 ± 39.67, and 154.34 ± 32.12, respectively, in the conventional group. There were no significant differences in the A-aDO_2 between the two groups at T1 (P > 0.05), whereas the A-aDO_2 of patients at T2, T3, and T4 was significantly higher in the conventional group than in the comprehensive group (P < 0.05). The Qs/Qt of patients at T1, T2, T3, and T4 was 12.86 ± 1.87, 10.94 ± 1.64, 9.65 ± 1.42, and 9.02 ± 1.05, respectively, in the comprehensive group and 12.73 ± 2.02, 12.74 ±

Table 4. Comparison of two groups of patients EORTCQLQ-C300

	Comprehensive Group (n = 127)	Conventional Group (n = 81)	t	P
Physical function	81.26 ± 8.28	62.12 ± 11.62	13.86	< 0.01
Role function	79.57 ± 6.65	72.71 ± 8.06	6.67	< 0.01
Cognitive function	85.18 ± 9.08	70.35 ± 10.58	10.76	< 0.01
Emotional function	81.95 ± 9.25	63.28 ± 12.77	12.21	< 0.01
Social function	86.34 ± 7.85	68.39 ± 8.24	15.77	< 0.01
The average score	82.85 ± 8.22	67.37 ± 10.25	12.01	< 0.01

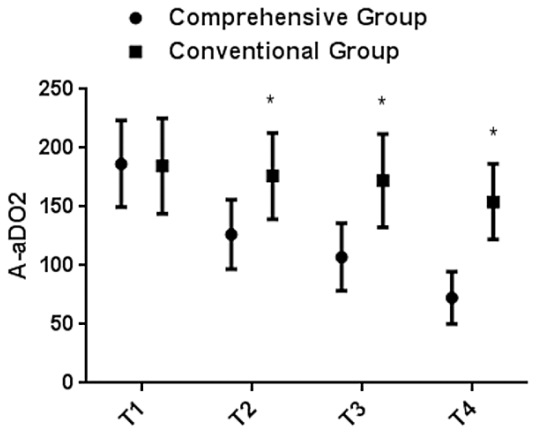

Figure 2. Comparison of two groups of patients' A-aDO_2. *represents P < 0.05 compared with the integrated group. The A-aDO_2 of the comprehensive group is significantly lower than that of the conventional group. The integrated group shows a steady decline, whereas the conventional group shows no significant changes.

3.57, 11.57 ± 1.59, and 11.82 ± 2.25, respectively, in the conventional group. The Qs/Qt of patients in the two groups was not significantly different at T1 (P > 0.05), whereas the Qs/Qt of patients at T2, T3 and T4 in the conventional group was significantly higher than that of patients in the comprehensive group (P < 0.05). The VC% of patients at T1, T2, T3, and T4 was 74.53 ± 5.62, 89.37 ± 5.16, 98.42 ± 6.81, and 112.24 ± 8.96, respectively, in the comprehensive group and 75.33 ± 6.01, 76.28 ± 6.84, 77.52 ± 6.24, and 82.15 ± 7.54, respectively, in the conventional group. The VC% of patients demonstrated no significant differences between the groups at T1 (P > 0.05), whereas the VC% of patients at T2, T3, and T4 was significantly lower in the conventional group than in the comprehensive group (P < 0.05). The MVV% of patients at T1, T2, T3, and T4 was 80.34 ± 4.24, 98.42 ± 8.21, 115.37 ±5.69, and 131.85 ± 6.96, respectively, in the comprehensive group and 81.05 ± 5.05, 82.34 ± 6.74, 86.43 ± 6.94, and 90.21 ± 4.84, respectively, in the conventional group. There were no significant differences in MVV% between the groups at T1 (P > 0.05), whereas the MVV% of patients at T2, T3, and T4 was significantly lower in the conventional group than in the comprehensive group (P < 0.05). See **Figures 2-5** for details.

Discussion

Lung cancer is one of the most common malignancies in the human body, and its death rate is the highest among all malignance [17]. There are no obvious characteristics in the early stage of lung cancer as patients do not often receive timely diagnosis and treatment owing to the lack of medical knowledge. Therefore, the majority of patients with lung cancer are in the middle-to-late stage at the time of diagnosis and thus miss the prime treatment window [18]. At present, surgical resection in combination with chemoradiotherapy remains the most common lung cancer treatment modality, although the lengthy period, painful process, and expensive cost of treatment pose a tremendous burden for patients and their family member [18]. Increasing numbers of studies [19-21] have shown that different nursing protocols directly result in different clinical findings in patients with lung cancer. A modality that can effectively replace the traditional regimen for the cure of lung cancer has not been researched and developed clinically; thus, the nursing protocol used with patients becomes a major influencing factor that may be controlled clinically. At present, the appropriate nursing care for patients with lung cancer during chemotherapy remains unknown. Our hypothesis, in which we analyze relevant factors experienced by patients with lung cancer during chemotherapy together with relevant literature, is that the application of a comprehensive nursing intervention protocol has a higher value. We screened study subjects strictly in accordance with the inclusion and exclusion criteria for

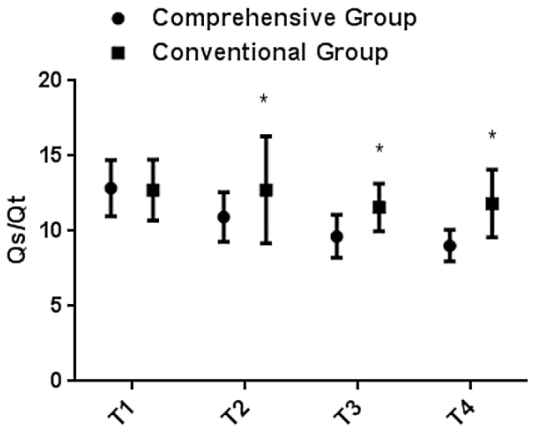

Figure 3. Comparison of Qs/Qt between two groups of patients. *represents P < 0.05 compared with the integrated group. The Qs/Qt of the comprehensive group is significantly lower than that of the conventional group. The integrated group shows a steady decline, while the conventional group shows no significant changes.

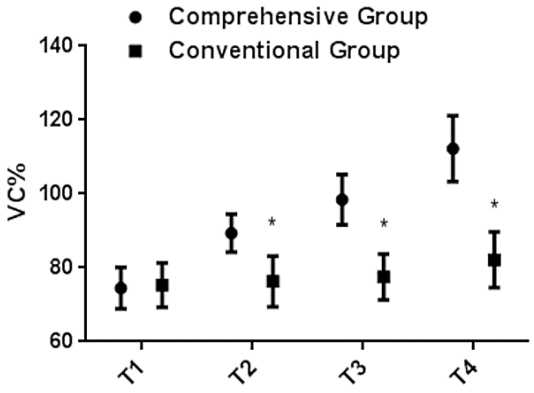

Figure 4. Comparison of VC% in both groups. *represents P < 0.05 compared with the integrated group. The VC% of the comprehensive group is significantly higher than that of the conventional group. The integrated group shows steady upward trend while the conventional group shows no significant changes.

data analysis to verify our hypothesis, with the aim of providing a credible guide for other healthcare providers in future clinical work with patients.

The results of this study showed that the comprehensive group using a comprehensive nursing intervention scored significantly better than the conventional group using a conventional nursing protocol with respect to measures of nursing satisfaction, complications, respiratory function, and EORTC QLQ-C30 score, and the root cause of clinical findings of patients in the

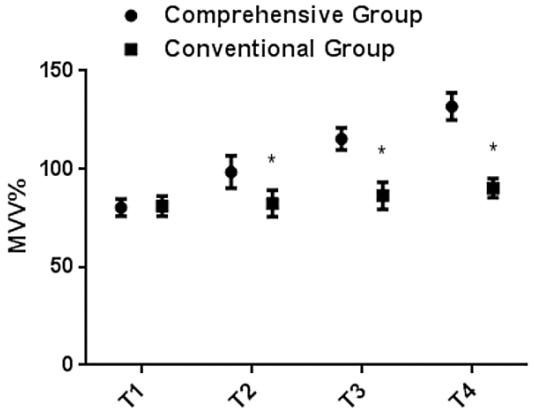

Figure 5. Comparison of MVV% between two groups. *represents P < 0.05 compared with integrated group. The MVV% in comprehensive group is significantly higher than that in conventional group. Integrated group shows steady upward trend while conventional group shows no significant changes.

two groups was the intervention influence of nursing protocol through analysis. The patients with lung cancer were affected by tension, melancholy, dysphoria, despair, and other negative emotions [22], whereas those in the comprehensive group were given specific psychological guidance, and the nurses patiently introduced the successful treatment to help the patients eliminate unhealthy emotions, maintain an optimistic attitude, and improve self-confidence during hospitalization and to allow the patients and their family members to be able to actively cooperate with the treatment, thus improving the nursing service, satisfaction with nursing, and nursing prognosis. During communication, the patients had certain knowledge and understanding of their diseases, and the occurrence of secondary recurrence was also greatly avoided. During chemotherapy, the dietary intervention provided to patients ensured that they met the standard of daily nutritional intake that is required to improve immunity, increase resistance to disease, and decrease the probability of occurrence of complications. During chemotherapy, vomiting and anorexia are very common adverse reactions [23], and injections of metoclopramide and ondansetron can effectively alleviate peristalsis and metabolism of gastrointestinal function and reduce the probability of occurrence of gastrointestinal reaction. As chemotherapy drugs are irritants and a misoperation can cause phlebitis in patients, which directly damages the surrounding tissues and

results in necrosis [24], puncturing the thick forearm veins with better elasticity during selection of a puncture point can effectively avoid secondary injury caused by chemotherapy drugs. Oral vitamin B supplements also prevent the occurrence of oral ulcers caused by chemotherapy, further improving patient prognosis. These findings are also consistent with the results obtained by Sheng et al. [25], providing support for the viewpoint of the present study. Observation of changes in lung function indices in the two groups showed that all indices of patients in the two groups improved, and the improvement in all indices in the comprehensive group was more significant and steady, indicating that the application of a comprehensive nursing intervention is more beneficial to the rehabilitation of patient lung function. Through the application of glucocorticoids, the exudation of lung tissue can be effectively reduced, but dosage should be strictly controlled during administration to prevent drug resistance and side effects. Also in the course of chemotherapy, patients generally suffered from pulmonary dysfunction. Movement guidance and rehabilitation training accelerate the recovery of body functions of patients and the enhancement of body resistance. The immunity was enhanced as well so that recovery of lung function was better, thus VC% and MVV% were bound to increase significantly. Close monitoring of patient's vital signs is more beneficial for the physical rehabilitation of patients.

In the present study, patients with lung cancer receiving a comprehensive nursing intervention during chemotherapy and patients receiving conventional nursing were compared. Limitations of the study include the smaller study population, relative homogeneity of study subjects, and relatively narrow age range of the study participants. In the future, we will perform a long-term tracking investigation of the subjects in this study and complete and improve the experimental design to achieve optimal experiment results.

In conclusion, compared with that of a conventional nursing protocol, the application of a comprehensive nursing internal protocol during chemotherapy for patients with lung cancer achieves higher satisfaction with nursing and can effectively improve the occurrence rate of patient's complications and enhance the recovery of patient's respiratory function. The comprehensive nursing protocol can thus be clinically applied.

Disclosure of conflict of interest

None.

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