Original Article
Effects of high quality nursing in patients with lung cancer undergoing chemotherapy and related influence on self-care ability and pulmonary function

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Abstract: Objective: To explore the effects of high quality nursing in patients with lung cancer undergoing chemotherapy and related influence on self-care ability and pulmonary function. Methods: 108 patients with lung cancer were grouped as the control group (54 cases, received routine nursing) and the observation group (54 cases, received high quality nursing including health education, psychological nursing, diet intervention, pain nursing and complication nursing). The psychology, self-care ability, pulmonary function, quality of life and complications before and after the intervention were compared. Results: After 2 months of intervention, peak expiratory flow (PEF), percentage of forced vital capacity (FVC%) and the ratio of forced expiratory volume in 1 second to forced vital capacity (FEV_1/FVC) of the two groups were all largely increased, and the observation group had even higher indexes than the control group (all P<0.05). Compared with before intervention, Hamilton Anxiety Scale (HAMA) and Hamilton Depression Scale (HAMD) scores of the two groups both decreased after 2 months of intervention, and the observation group had lower score than the control group. The score of Exercise of Self-care Agency (ESCA) Scale and the quality of life questionnaire-C30 formulated by the European Organization for research and treatment of cancer (EORTC QLQ-C30) in the two groups were both elevated after the intervention and the observation group had higher scores than the control group (all P<0.05). The observation group had much lower total incidence of adverse reactions than the control group during chemotherapy (P<0.05). Conclusion: High quality nursing for patients with lung cancer undergoing chemotherapy effectively alleviates the bad mood and improves the quality of life and lung function, which is worthy of clinical application.

Keywords: High quality nursing, lung cancer, self-care ability, psychology, pulmonary function

Introduction

Lung cancer is a malignancy with relatively high morbidity. The World Health Organization (WHO) reported that lung cancer related death was as high as 1.1 million per year, accounting for 17.8% of all cancer related death. Up to now, the morbidity of lung cancer is increasing year by year [1]. One of the main treatments for lung cancer is chemotherapy, which needs a long process and is always accompanied with obvious side effects. In the process of chemotherapy, some patients have different degrees of psychological disorders, which not only affect the effect of chemotherapy, but also reduce the quality of life of patients [2]. Therefore, it is of great significance to provide scientific and high-quality nursing for patients during chemotherapy to improve their bad emotions and quality of life.

High quality nursing is patient-centered and it strengthens the basic nursing and nursing responsibility, thus providing the patients with "high quality and efficient" medical services. High quality nursing has been widely used in many clinical departments, and shows good therapeutic effect. Mendes et al. reported that high quality nursing improved the cardiac function of patients with coronary heart disease, and also helped to enhance the treatment compliance [3]. Burton et al. demonstrated that high quality nursing improved the postoperative quality of life of patients with gastric cancer

resection [4]. However, research about the effects of high-quality nursing on self-care ability of lung cancer patients during chemotherapy is extremely rare. It is also unknown whether different nursing methods have different effects on lung function of lung cancer patients. Therefore, this study explored the effects of high-quality nursing in patients with lung cancer undergoing chemotherapy, and analyzed its impact on patients' self-care ability and lung function.

Materials and methods

General materials

108 cases of lung cancer patients admitted in our hospital from December 2018 to February 2020 were selected as the research objects. These patients were grouped into the control group and the observation group according to the random number table method. Inclusion criteria: Patients aged between 35-75 years; patients confirmed by pathological biopsy as lung cancer in accordance with the "Diagnosis and treatment of primary lung cancer (2011 Edition)"; patients received chemotherapy [5]; Karnofsky (KPS) scores ≥70; life expectancy > 3 month; patients signed the informed consent. Exclusion criteria: Patients with other malignant tumors; patients with chemotherapy contraindications or allergic to the drugs used in this study; patients complicated with cerebral embolism, cerebral hemorrhage and other serious medical diseases; patients with abnormal liver and kidney function or obvious organic lesions; patients with diseases of immune system, blood system and endocrine system; patients participated in other researchers, etc. This study was approved by the medical ethics committee of our hospital.

Methods

Patients in both groups received chemotherapy and took gemcitabine (Nanjing Zhengda Tianqing Pharmaceutical Co., Ltd., specification: 1.0 g, origin: China) intravenously at the dose of 1,000-1,250 mg/m² on the 1st and 8th day; patients were also treated with Cisplatin (Jiangsu Haosen Pharmaceutical Group Co., Ltd., specification: 6 mL: 30 mg, origin: China) intravenously at the dose of 25 mg/m² from day 1 to day 3; patients also took gefitinib tablets (Jiangsu Hengrui Pharmaceutical Co., Ltd.,

specification: 0.25 g, origin: China) orally, 0.25 g/day, once a day. In addition, palonosetron hydrochloride injection (Jiangsu aosaikang Pharmaceutical Co., Ltd., specification: 5 mL: 0.25 mg based on palonosetron, origin: China) was given intravenously every day to prevent vomiting. 21 days were taken as a course of chemotherapy and the patients needed 2 courses continuously.

Patients in the control group received routine nursing during chemotherapy: follow the doctor's advice and cooperate with clinicians to implement chemotherapy; take oral analgesics to relieve pain; have more meals a day but less food at each time; take light and digestible diet and have more water; follow the discharge guidance, etc.

Patients in the observation group received high quality nursing: (1) Health education: nurses explain lung cancer related knowledge, treatment measures, possible adverse reactions and countermeasures to patients; (2) Psychological nursing: cancer patients are prone to various degrees of bad psychology induced by many factors, such as tension and anxiety, which need the nurses to communicate with the patients more frequently [6]. Not the disease, but some daily interesting things are included in the chat. In the process of chatting, nurses could learn about the emotional fluctuation of patients. The nurses or counselors should give targeted psychological counseling according to the specific situation of patients, so as to eliminate the negative emotions of patients and encourage the patients to actively cooperate with the treatment; (3) Dietary intervention: patients with advanced cancer are often accompanied with malnutrition, so it is very important to give reasonable dietary intervention to maintain the nutrition needed by patients with advanced cancer and to improve their malnutrition [7]. Nutritionists can evaluate the nutritional status of patients according to the clinical examination results, and give targeted dietary advice according to the dietary guidance for patients with malignant tumor (Health industry standard of the People's Republic of China No.: WS/T 559-2017) based on the specific situation of patients. The patients were instructed to take food containing more proteins and vitamins to ensure the protein intake of 1 kcal/(kg·d)-1.2 kcal/(kg·d).

The energy supply of fat and carbohydrate should account for 35-50% of the total energy. Adults should eat 200-400 g of cereals every day, take more fruits and milk, try to adopt the low-fat diet and reduce cholesterol intake. In addition, alcohol and spicy food should be forbidden during chemotherapy; (4) Pain care: lung cancer patients are prone to bone metastasis, which causes pain. Thus, timely analgesic measures should be given to patients with obvious pain. Pethidine or morphine can be used for patients with moderate to severe pain and fentanyl transdermal patch or PCs could be used for patients with severe pain; (5) Complications nursing: chemotherapy is often accompanied by obvious gastrointestinal reactions such as nausea, vomiting and hematotoxic side effects such as bone marrow suppression [8]. Therefore, appropriate measures should be taken to prevent the occurrence of complications, such as tropisetron or palonosetron for antiemetic before chemotherapy, and colony-stimulating factor for the suppression of bone marrow suppression caused by chemotherapy. At the same time, the blood routine and liver and kidney function of patients should be checked regularly and the dosage of chemotherapy drugs should be adjusted in time in case of abnormality.

Outcome measures

Main outcome measures: The observation time was set as before the intervention and 2 months after the intervention.

(1) Pulmonary function: the peak expiratory flow (PEF), percentage of forced vital capacity (FVC%) and the ratio of forced expiratory volume in 1 second to forced vital capacity (FEV_1/FVC) were measured by the pulmonary function instrument (Guangzhou Aoxun Instrument Co., Ltd., China).

(2) Psychology: Psychology was evaluated by Hamilton Anxiety Scale and Hamilton Depression Scale (HAMA, HAMD) [9, 10]. HAMA ≥7 indicates that the patient may have anxiety, and HAMA <7 indicates that the patient has no anxiety; HAMD (17 items) scores 7-17 suggests that the patient may have depression symptoms; HAMD <7 suggests that the patient has no depression symptoms. The degree of anxiety and depression increased with the score.

(3) Self-care ability: self-care ability was scored according the Exercise of Self-care Agency (ESCA) scale, with a total of 172 points. The higher the score is, the stronger the self-care ability of the patient is [11].

Secondary outcome measures: (1) The adverse reactions such as gastrointestinal reactions, myelosuppression, alopecia, hepatotoxicity, nephrotoxicity and neurotoxicity were compared between the two groups during chemotherapy. The total incidence of adverse reactions was calculated as the number of adverse reactions/total cases ×100%. (2) Quality of life: quality of life was evaluated by the quality of life questionnaire-C30 formulated by the European Organization for research and treatment of cancer (EORTC QLQ-C30) [12]. It contains four dimensions including functional domain, symptom domain, overall quality of life domain and single item, with 100 points per dimension. The higher the score is, the better the quality of life is.

Statistical analysis

SPSS 20.0 was used for data analysis. The enumeration data were expressed as n (%) and were compared by chi square test; measurement data were shown in $\bar{x} \pm sd$. Paired t-test was used for comparison before and after intervention, and independent t-test was used for comparison between the two groups. P<0.05 means that the difference is statistically significant.

Results

Comparison of general information between the two groups

No significant difference existed in the general information between the two groups (P > 0.05) and the two groups were comparable. See **Table 1** for details.

Pulmonary function

After 2 months of intervention, PEF, FVC% and FEV_1/FVC of the two groups were all significantly increased, and the observation group had higher indexes than the control group (all P<0.05). See **Table 2** for details.

Table 1. General information of the two groups (n, x̄ ± sd)

	The observation group (n=54)	The control group (n=54)	χ²/t	P
Gender (n)			1.341	0.247
Male	28	22		
Female	26	32		
Age (years)	57.5±5.4	56.8±6.2	0.626	0.533
Pathological types (n)			0.641	0.726
Adenocarcinoma	42	39		
Squamous cell carcinoma	7	10		
Squamous adenocarcinoma	5	5		
Clinical stages (n)			1.573	0.456
Stage II	21	19		
Stage II	18	24		
Stage IV	15	11		
KPS scores	76.67±5.40	77.12±6.44	0.393	0.695
Underlying diseases (n)			0.243	0.885
Diabetes	6	4		
Hypertension	10	8		
Hyperlipidemia	7	7		
Hemoglobin (Hb) level (g/L)	117.28±10.94	119.94±12.27	1.189	0.237
Innutrition (n)			0.468	0.494
Yes	11	14		
No	43	40		
Smoking history (n)			0.150	0.700
Yes	26	24		
No	28	30		
Drinking history (n)			0.361	0.548
Yes	18	21		
No	36	33		
Previous chemotherapy history (n)			1.363	0.243
Yes	20	26		
No	34	28		

Note: KPS: Karnofsky.

Psychology

Compared with before intervention, HAMA and HAMD scores of the two groups both decreased after 2 months of intervention, and the observation group had lower scores than the control group (both P<0.05). See **Table 3** for details.

The scores of exercise of self-care agency (ESCA)

Compared with before intervention, the scores of self-concept, self-care skills, self-responsibility and health knowledge level of the two groups all increased after the intervention, and the observation group had higher scores than the control group (all P<0.05). See **Table 4** for details.

Adverse reaction

During chemotherapy, the total incidence of adverse reactions in the observation group was 9.26% (1 case of gastrointestinal reaction, 2 cases of myelosuppression and 2 cases of alopecia), which was significantly lower than 24.07% in the control group (3 cases of gastrointestinal reaction, 3 cases of myelosuppression, 4 cases of alopecia, 1 case of hepatotox-

Table 2. Pulmonary function of the two groups before and after intervention ($\overline{x} \pm sd$)

Groups	PEF (L/s)	FVC%	FEV$_1$/FVC
The observation group (n=54)			
Before the intervention	2.37±0.73	55.39±6.38	59.30±5.50
After 2 months of intervention	3.34±0.86*,#	65.98±5.52*,#	74.05±6.38*,#
The control group (n=54)			
Before the intervention	2.13±0.80	55.36±6.41	60.10±6.38
After 2 months of intervention	2.83±0.67*	59.64±4.66*	65.28±5.74*

Note: PEF: peak expiratory flow; FVC%: percentage of forced vital capacity; FEV$_1$/FVC: the ratio of forced expiratory volume in 1 second to forced vital capacity. *P<0.05 compared with before the intervention; #P<0.05 compared with the control group after the intervention.

Table 3. HAMA and HAMD scores of the two groups before and after the intervention ($\overline{x} \pm sd$, score)

Groups	HAMA score	HAMD score
The observation group (n=54)		
Before the intervention	6.98±1.04	7.33±1.64
After 2 months of intervention	5.24±1.08*,#	5.49±1.17*,#
The control group (n=54)		
Before the intervention	7.05±1.10	7.53±1.84
After 2 months of intervention	6.10±1.42*	6.20±1.60*

Note: HAMA: Hamilton Anxiety Scale; HAMD: Hamilton Depression Scale. *P<0.05 compared with before the intervention; #P<0.05 compared with the control group after the intervention.

icity, 1 case of nephrotoxicity and 1 case of neurotoxicity) (P<0.05). See **Figure 1** for details.

Quality of life

Two months after the intervention, the EORTC QLQ-C30 scores in each dimension of the two groups were all higher than those before the intervention. At the same time, the observation group had higher scores than the control group (all P<0.05). See **Table 5** for details.

Discussion

The morbidity of lung cancer is gradually increasing due to various factors such as environmental pollution and smoking. As one of the main treatment measures, chemotherapy is followed by various toxic and side effects which reduce the treatment compliance of some patients. Some patients even give up the treatment because of intolerable adverse reactions [13]. Therefore, high quality nursing during chemotherapy is very helpful for reducing chemotherapy related complications and improving

prognosis. Stewart et al. showed that different nursing methods had different effects on lung function of lung cancer patients [14]. In this study, the improvement of lung function indexes in the observation group was better than that in the control group after 2 months of intervention, suggesting that high-quality nursing significantly improved lung function for lung cancer patients undergoing chemotherapy compared with the conventional nursing. Health education in the high quality nursing helps the patients understand the necessity and importance of actively cooperating with the treatment, which improves the treatment compliance of patients. Therefore, high quality nursing is conducive to improving the clinical effects of chemotherapy, and better improves the lung function of patients.

Self-care ability refers to the ability of patients to take care of themselves during illness. Previous study pointed out that the level of self-care ability of patients directly determined their self-efficacy, and the enhancement of self-efficacy of patients further promoted the prognosis [15]. In this study, the scores of self-concept, self-care skills, self-responsibility and health knowledge in the observation group were higher than those in the control group after the intervention, suggesting that the implementation of high-quality nursing can significantly improve the self-care ability of lung cancer patients receiving chemotherapy. Similar conclusions were also found in the study of Brown et al., which pointed out that high-quality nursing enhanced patients' self-care ability and self-efficacy compared with conventional nursing measures [16]. The high-quality nursing in this study is more comprehensive and scientific in many aspects, such as health education,

Table 4. ESCA scores of the two groups before and after the intervention ($\bar{x} \pm sd$, score)

Groups	Self-concept	Self-care skills	Self-responsibility	Health knowledge level
The observation group (n=54)				
Before the intervention	24.40±3.39	30.09±5.44	20.05±2.88	25.50±3.85
After 2 months of intervention	34.46±4.48[*,#]	38.89±4.08[*,#]	27.70±3.37[*,#]	34.89±4.20[*,#]
The control group (n=54)				
Before the intervention	25.12±5.22	29.96±4.80	20.74±3.20	26.03±5.37
After 2 months of intervention	30.08±4.38[*]	33.87±4.95[*]	24.48±3.75[*]	31.10±3.33[*]

Note: ESCA: Exercise of Self-care Agency. [*]$P<0.05$ compared with before the intervention; [#]$P<0.05$ compared with the control group after the intervention.
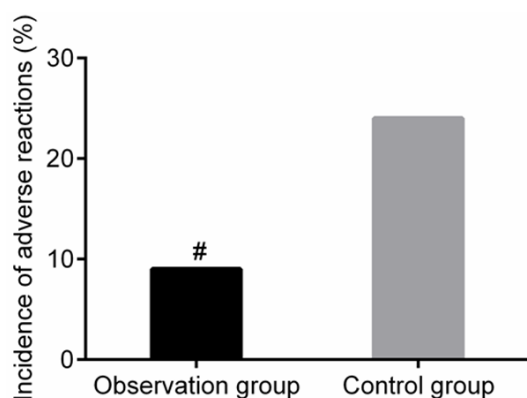
Figure 1. Adverse reaction of the two groups during chemotherapy. [#]$P<0.05$ compared with the control group.

psychological nursing, diet intervention, pain nursing and complication nursing. At the same time, patients have a more comprehensive understanding of lung cancer related knowledge, treatment measures, possible adverse reactions and coping measures through health education, which is helpful to enhance the treatment compliance of patients and improve the self-care ability of patients [17].

Affected by many factors such as chemotherapy adverse reactions, cancer pain and the prognosis, most cancer patients may have different degrees of adverse psychological state, and even develop into depression. Some patients may even have suicidal thoughts, resulting in a significant decline in quality of life [18]. A study pointed out that up to 75% of patients with advanced cancer might have psychological disorder, which not only affects the effects of radiotherapy and chemotherapy, but also reduces the treatment compliance of patients [19]. In this study, patients in the observation group

had lower HAMA and HAMD scores and higher EORTC QLQ-C30 scores of each dimension than those of the control group after 2 months of intervention, suggesting that high-quality nursing strongly improves the anxiety, depression and other adverse psychological states, and improves the quality of life for lung cancer patients receiving chemotherapy. Griffiths et al. also found that high-quality nursing improved the quality of life of cancer patients [20]. Adam et al. also found that the psychological state of cancer patients with obvious psychological disorders was significantly improved after receiving the high-quality nursing [21]. In addition to the routine nursing of pain and complications, high-quality nursing also pays attention to the psychological counseling of patients. The nurses can capture emotional fluctuations of patients in time through communication and conduct targeted psychological counseling, thus improving the bad psychological state and quality of life of patients [22]. In addition, our present study also found that the observation group had lower incidence of complications during chemotherapy than the control group, suggesting that high-quality nursing can largely reduce the incidence of complications for lung cancer patients receiving chemotherapy. However, this study is a single center study with limited sample size, thus further study is needed to confirm the effects of high-quality nursing on long-term lung function and self-care ability of patients.

In conclusion, high quality nursing effectively alleviates the bad mood, improves the quality of life and lung function, and reduces the risk of complications for lung cancer patients with chemotherapy, which is worthy of clinical application.

Table 5. EORTC QLQ-C30 scores of the two groups in each dimension before and after intervention ($\bar{x} \pm$ sd, score)

Groups	Functional domain	Symptom domain	Overall quality of life domain	Single item
The observation group (n=54)				
Before the intervention	60.06±6.59	58.89±5.30	60.05±5.44	68.88±5.50
After 2 months of intervention	69.98±5.73[*,#]	69.98±5.88[*,#]	68.80±6.10[*,#]	79.95±6.83[*,#]
The control group (n=54)				
Before the intervention	59.87±5.94	59.14±4.97	60.83±5.94	69.64±6.39
After 2 months of intervention	65.60±6.40[*]	63.39±5.49[*]	64.48±6.82[*]	74.40±5.84[*]

Note: EORTC QLQ-C30: the quality of life questionnaire-C30 formulated by the European Organization for research and treatment of cancer. [*]P<0.05 compared with before the intervention; [#]P<0.05 compared with the control group after the intervention.

Disclosure of conflict of interest

None.

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