

Original Article

Effects of respiratory function exercise combined with detailed nursing on patients with chronic obstructive pulmonary disease

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Abstract: Objective: This study aimed to evaluate the impacts of respiratory function exercise combined with detailed nursing on patients with chronic obstructive pulmonary disease (COPD). Methods: From March 2018 to December 2019, a total of 159 COPD patients in our hospital were recruited and divided into a control group (n=72) and a study group (n=87) according to the nursing schemes. Patients in the control group received routine detailed nursing, and patients in the study group received respiratory function exercise in addition to routine detailed nursing. The general data, PaO₂, PaCO₂, self-management ability, and quality of life of the two groups were recorded and compared. Results: There was no difference in general data between the two groups. After nursing, patients in the study group showed better lung function indices, better self-management ability, lower degrees of depression and anxiety, better quality of life, lower incidence of adverse reactions, and higher nursing satisfaction. Conclusion: Respiratory function exercise combined with detailed nursing can improve lung function indices, self-management ability, and quality of life of COPD patients.

Keywords: Respiratory function exercise, detailed nursing, chronic obstructive pulmonary disease, lung function indices

Introduction

Chronic obstructive pulmonary disease (COPD) is a common respiratory disease with persistent respiratory symptoms and limited airflow [1]. It is the fourth most fatal disease in the world, with more than 250 million cases [2]. The pathogenesis of COPD is a dynamic and cumulative process that is bound up with the external environment and intrinsic genes [3, 4], and smoking and air pollution (e.g., PM_{2.5}) are the main risk factors for COPD [5]. COPD has a poor prognosis and high readmission rate and mortality rate. Nevertheless, reasonable self-management planning will help to improve the prognosis of patients and promote their rehabilitation [6].

Maintaining physical activity is essential in COPD patients, and respiratory function training is an effective approach [7]. Respiratory function training is to improve patients' breath-

ing patterns through reducing respiratory frequency and dyspnea [8]. Respiratory function exercise can help improve respiratory muscle function and reduce dyspnea, and may improve exercise tolerance in patients who are unable to exercise [9, 10]. The team of Lu [11] confirmed that respiratory function exercise can improve patients' health-related quality of life and respiratory function. Respiratory function exercise also plays an active role in ameliorating patients' negative emotions [12]. In addition, improving patients' self-management awareness is also conducive to improving the health-related quality of life of COPD patients [13]. The role of nursing interventions and health promotion in the management of COPD is becoming increasingly evident. COPD patients are prone to negative emotions due to dyspnea, so medical staff should provide effective nursing management for patients from both physical and psychological aspects [14].

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The team of Li [15] also shows that continuous nursing is beneficial for patients with COPD so as to improve their quality of life.

In this study, by evaluating the lung function indices, self-management ability, negative emotion, quality of life, adverse reactions, and nursing satisfaction of the two groups of COPD patients with different nursing strategies, the improvement effects of respiratory function exercise combined with detailed nursing on COPD was compared and discussed.

Methods

General data

A total of 159 COPD patients were recruited, and they were divided into a control group (n=72) and a study group (n=87) according to different nursing schemes. In the control group, there were 43 males and 39 females, aged 67.72 ± 5.12 years. This group was composed of 26 cases of bronchial asthma, 29 cases of emphysema, 11 cases of chronic bronchitis and 6 cases of pulmonary heart disease. In the study group, there were 48 males and 39 females, aged 68.19 ± 5.26 years. This group was composed of 35 cases of bronchial asthma, 31 cases of emphysema, 16 cases of chronic bronchitis and 5 cases of pulmonary heart disease. All subjects signed informed consent according to the *Declaration of Helsinki*. This research was approved by the hospital ethics committee.

Inclusion and exclusion criteria

Inclusion criteria: patients whose COPD were diagnosed according to pulmonary function examination and CT results, and showed symptoms such as chronic cough, expectoration and dyspnea. Exclusion criteria: patients with cardiovascular diseases; patients being treated with other drugs; patients in pregnancy or lactation period; patients with renal dysfunction; patients with mental disorder or communication disorder; patients did not cooperate with this research.

Methods

From March 2018 to December 2019, a total of 159 COPD patients were recruited and divided into a control group (n=72) and a study group

(n=87). Patients in the control group received routine detailed nursing, including basic nursing, oxygen therapy and psychological nursing. On the basis of routine detailed nursing, patients in the study group adopted respiratory function training, mainly including breathing exercises training, abdominal breathing training and lip girdle expiration.

Outcome measures

(1) PaO_2 and PaCO_2 before and after nursing were observed and recorded. (2) The self-management ability of patients in the two groups were observed and recorded, and the self-management ability of patients was assessed with a health knowledge questionnaire. According to the results of questionnaire, those with less than 18 points were of low level, those with 18 to 24 points were of medium level, and those with more than 24 points were of high level. (3) Quality of life of the two groups of patients was observed and recorded. The patients' quality of life was evaluated by St. George's respiratory questionnaire (SGRQ). The questionnaire mainly included symptoms, activity, social psychological influence and total score. The score was inversely proportional to the quality of life. (4) The anxiety and depression of the two groups of patients were observed and recorded. The Self-rating Anxiety scale (SAS) was applied to assess the anxiety degrees of patients, and the Self-rating Depression Scale (SDS) to assess their depression degrees. Both scores were proportional to the level of anxiety or depression. (5) The nursing satisfaction and adverse reactions of patients were observed and recorded. Adverse reactions included gaseous distention, redness and swelling of the nose and mouth, and pressure injuries to the facial skin. Total incidence of adverse reactions = (cases of gaseous distention + cases of redness and swelling of the nose and mouth + cases of pressure injuries to the facial skin)/number of cases in each group. The nursing satisfaction included three grades of greatly satisfied, satisfied, and dissatisfied, and the satisfaction degree = (greatly satisfied + satisfied)/number of cases in each group.

Statistical methods

SPSS 22.0 (IBM, Armonk, New York, USA) software was applied for statistical analysis of data, and GrahPad8.0 for image rendering.

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Table 1. General data

	Control group n=72	Study group n=87	T/X ²	P
Gender			0.332	0.564
Male	43 (59.72)	48 (55.17)		
Female	29 (40.28)	39 (44.83)		
Age	67.72±5.12	68.19±5.26	0.568	0.571
BMI	20.09±1.03	19.84±1.09	1.476	0.142
Excessive drinking history			1.349	0.258
Present	21 (29.17)	33 (37.93)		
Absent	51 (70.83)	54 (62.07)		
Smoking history			0.475	0.491
Present	25 (34.72)	36 (41.38)		
Absent	47 (65.28)	51 (58.62)		
Educational background			1.088	0.297
<Junior high school	28 (38.89)	41 (35.63)		
≥Junior high school	44 (61.11)	46 (64.37)		
Disease type			1.107	0.775
Bronchial asthma	26 (36.11)	35 (40.23)		
Emphysema	29 (40.28)	31 (35.63)		
Chronic bronchitis	11 (15.28)	16 (18.39)		
Pulmonary heart disease	6 (8.33)	5 (5.75)		

Table 2. Lung function indices

		Control group n=72	Study group n=87	t	P
PaCO ₂ (kPa)	Before nursing	7.13±1.05	7.01±1.12	0.692	0.490
	After nursing	6.71±1.01	6.21±1.03	3.074	0.003
PaO ₂ (kPa)	Before nursing	6.24±1.19	6.52±1.14	1.511	0.133
	After nursing	7.23±1.22	7.98±1.32	3.718	0.0003

The measurement data were expressed by mean ± SD, and the counting data by n (%). For the data consistent with normal distribution, independent sample t-test and paired sample t-test were used for difference analysis. Taking 95% as its confidence interval, the difference was statistically significant when P<0.05.

Results

Respiratory exercise combined with detailed nursing is more conducive to improving lung function

We recruited 159 COPD patients and divided them into a control group (n=72) and a study group (n=87) according to different nursing schemes. There was no statistical difference in gender, age, body mass index (BMI), excessive drinking history, smoking history, educational background and disease types between the two groups (**Table 1**), which could be adopted

for follow-up study. We recorded their PaCO₂ and PaO₂ before and after nursing for the evaluation of lung function (**Table 2**). After nursing, patients in both groups had reduced PaCO₂ and elevated PaO₂, and such two trends were more obvious in the study group than in the control group. The above results indicate that respiratory function exercise combined with detailed nursing is more beneficial to improving lung function.

Respiratory exercise combined with detailed nursing is more conducive to improving self-management ability

In this paper, the health knowledge questionnaire was utilized to evaluate the self-management ability of patients. The score of less than 18 was considered as low level, the score of 18-24 as medium, and the score of over 24 as high. The results of the two groups are shown in **Table 3**. In the control group, 11 patients scored less than 18, 24 patients scored from 18 to 24, and 37 patients

scored over 24. In the study group, 8 patients scored less than 18, 17 patients scored from 18 to 24, and 62 patients scored over 24. The number of people in each segment of the health knowledge questionnaire was statistically different between the two groups, with the study group scoring higher than the control group. The above results suggest that respiratory exercise combined with detailed nursing helps improve self-management ability.

Respiratory exercise combined with detailed nursing is more conducive to improving the quality of life of patients

The SCRQ was applied to evaluate patients' quality of life, as shown in **Figure 1A**. The symptom, activity, social psychological influence and total scores of the study group were lower than those of the control group, indicating that respiratory function exercise combined with

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Table 3. Score of health knowledge questionnaire

Knowledge score	Control group n=72	Study group n=87	χ^2	P
			5.429	0.020
<18 points	11 (15.28)	8 (9.20)		
18-24 points	24 (33.33)	17 (19.54)		
>24 points	37 (51.39)	62 (71.26)		

detailed nursing can better improve patients' quality of life.

Respiratory function exercise combined with detailed nursing is more conducive to relieving anxiety and depression of patients

The SAS and SDS were applied to evaluate the anxiety and depression of patients in the two groups before and after nursing, as shown in **Figure 1B** and **1C**. After nursing, SAS and SDS scores were statistically reduced in both groups, and the two scores were statistically lower in the study group. The above results suggest that respiratory function exercise combined with detailed nursing facilitates the relief of patients' anxiety and depression.

Respiratory function exercise combined with detailed nursing is conducive to improving patient nursing satisfaction and reducing adverse reactions

Patients' nursing satisfaction was investigated and exhibited in **Table 4**. In the control group, 37 patients were greatly satisfied with nursing, 19 were satisfied, and 16 were dissatisfied, with a satisfaction degree of 77.78%. In the study group, 54 patients were greatly satisfied with nursing, 25 were satisfied, and 8 were dissatisfied, with a satisfaction degree of 90.80%. The satisfaction of the study group was statistically higher than that of the control group. **Table 5** shows the adverse reactions of the two groups. In the control group, there were 5 cases of gaseous distention, 1 case of redness and swelling of the mouth and nose, and 3 cases of pressure injuries to the facial skin, with the total adverse reaction rate of 12.50%. In the study group, there were 2 cases of gaseous distention, and 1 case of redness and swelling of the mouth and nose, with the total adverse reaction rate of 3.45%. The total incidence of adverse reactions in the study group was statistically lower than that in the control group. Such above reveal that respiratory function exercise combined with detailed nursing can

improve patients' nursing satisfaction and reduce adverse reactions.

Discussion

PaCO₂ and PaO₂ are commonly used indexes in evaluating the pulmonary function of patients. According to this study, PaCO₂ and PaO₂ improved better in the study group compared to the control group. Difficulty in breathing caused by COPD is a major constraint on physical activity, and the limitation of physical activity also leads to muscle atrophy [16]. Respiratory function exercise is an important part of lung rehabilitation program, which plays a significant positive role in facilitating the recovery of lung function and strengthening respiratory muscles. Respiratory function exercise reduces malignant ventilation and alleviates respiratory symptoms through deep breathing and slow breathing [17]. A study of meta-analysis [18] suggested that the conditional use of respiratory exercise can improve the ventilation quality and life quality of COPD patients. Therefore, respiratory function exercise combined with detailed nursing can promote the recovery of pulmonary function of patients more effectively.

Anxiety and depression are common negative emotions in COPD patients, and dyspnea and decreased physical activity are the main causes of anxiety and depression [19]. Detailed nursing mainly includes the monitoring of vital signs of patients, the giving of appropriate oxygen therapy, and timely psychological care. Therefore, in the process of rehabilitation, patients can not only improve lung function through respiratory exercise, but also receive psychological counseling. Respiratory function exercise combined with detailed nursing can relieve patients' anxiety and depression from both physical and psychological aspects.

The role of self-management in COPD is becoming increasingly clear [20]. Self-management can help patients understand their own illness and conditions, so as to better concern themselves [21]. Here, after respiratory function exercise combined with detailed nursing, the patients' mastery of their diseases and related skills increased markedly, and such ability was higher in the study group than in the

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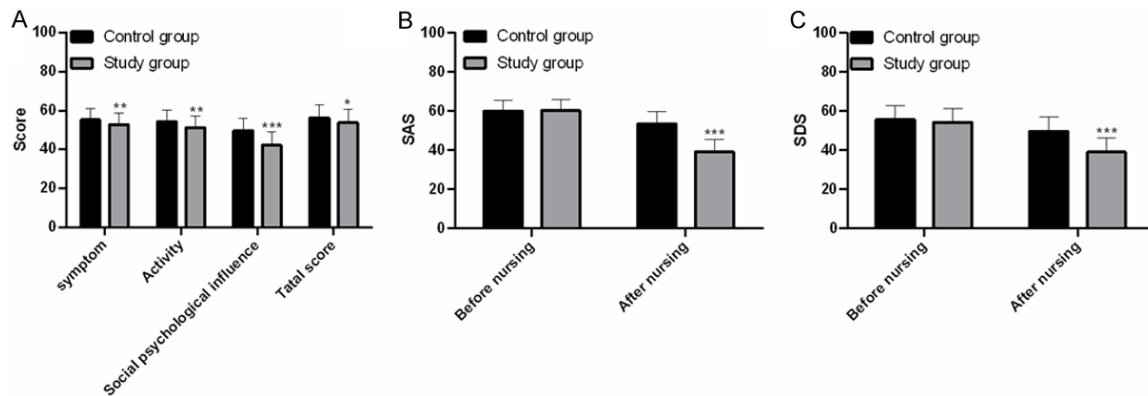


Figure 1. Quality of life score, anxiety and depression of two groups of patients. (Control group, n=72; Study group, n=87. *P<0.05 vs. the control group, **P<0.01 vs. the control group, ***P<0.001 vs. the control group. A. Quality of life score of two groups before and after nursing. QOL means quality of life. B. SAS scores of two groups before and after nursing. C. SDS scores of two groups before and after nursing. ***P<0.001 vs. the control group).

Table 4. Nursing satisfaction

	Control group n=72	Study group n=87	χ^2	P
Greatly satisfied	37 (51.39)	54 (62.07)		
Satisfied	19 (26.39)	25 (28.73)		
Dissatisfied	16 (22.22)	8 (9.20)		
Satisfaction degree	56 (77.78)	79 (90.80)	5.217	0.022

Table 5. Adverse reactions

	Control group n=72	Study group n=87	χ^2	P
Gaseous distention	5 (6.94)	2 (2.30)		
Red nose and mouth	1 (1.39)	1 (1.15)		
Facial skin crush injury	3 (4.17)	0		
Total incidence of adverse events	9 (12.50)	3 (3.45)	4.422	0.036

control group. The above results indicate that respiratory function exercise combined with detailed nursing has better impacts on improving patients' self-management level.

In this study, the quality of life of patients in the study group was higher than that in the control group. It is suggested [22] that self-management skills are independently associated with quality of life, which implies that patients' quality of life improves with the improvement of self-management ability. This is possibly due to the fact that respiratory function exercise combined with detailed nursing plays a better role in improving the quality of life.

The main shortcomings of this study are as follows: first, due to time constraints, only 159

subjects were recruited in this study, and we will expand the sample size to obtain more accurate statistical results in the follow-up study. Second, it is believed that there may be long-term effects of nursing interventions on COPD, and this study mainly focuses on the short-term effects of respiratory function exercises combined with detailed nursing, so we will follow the patients for a long time to explore the long-term effects of this program on COPD in the follow-up study. Last,

the respiratory function exercise combined with detailed care protocol still has many details that need to be refined and improved, which will also be discussed in the follow-up study.

To sum up, respiratory function exercise combined with detailed nursing can improve the lung function indices of COPD patients, improve their self-management ability and quality of life, reduce the occurrence of adverse reactions, relieve their negative emotions, and increase their treatment compliance. Therefore, this program is expected to play a significant role in clinical setting against COPD.

Disclosure of conflict of interest

None.

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