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Research Article

The Efficacy Analysis of Transbronchoscopic Large Volume Lung Lavage in Treatment of Pneumoconiosis Complicated with Chronic Obstructive Pulmonary Disease

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Abstract: ***Objective:*** To evaluate the efficacy of transbronchoscopic large volume lung lavage in the treatment of pneumoconiosis complicated with chronic obstructive pulmonary disease (COPD). ***Methods:*** The clinical data of 80 patients with pneumoconiosis complicated with COPD admitted to our hospital from June 2017 to January 2019 were retrospectively analyzed. 40 patients in the control group were treated with conventional drugs and 40 patients in the observation group treated with conventional drugs plus transbronchoscopic large-volume lung lavage. Dyspnea score and healthy quality of life were compared between the two groups. ***Results:*** the scores of dyspnea in the observation group were significantly lower than those in the control group at 12, 24 and 48 weeks after treatment, *and* the (SGRQ) scores of George's respiratory problems questionnaire in the observation group were significantly lower than those in the control group at 12, 24 and 48 weeks after treatment. ***Conclusion:*** Thetransbronchoscopic large volume of lung lavage has a significant effect on the treatment of pneumoconiosis patients with COPD, which can effectively reduce the degree of dyspnea and improve the quality of life.

Keywords: Large-volume lung lavage; Bronchus; Pneumoconiosis; Chronic obstructive pulmonary disease

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As the second largest factor complicated with

chronic obstructive pulmonary disease (COPD), Occupational dust accounts for 30.10% of non-smoking COPD patients, while the incidence of COPD in pneumoconiosis patients is as high as 76.80%[1]. Pneumoconiosis patients complicated with COPD will aggravate the damage of pulmonary function to a certain extent, lead to dyspnea, and seriously affect the quality of life of patients. In the early stage, conventional drugs are mostly used to treat the disease, but its therapeutic effect is not satisfactory, and therapeutic drugs will mostly produce toxic and side effects. However, it has been reported that a large volume of whole lung lavage can improve the clinical symptoms of pneumoconiosis patients with COPD[2]. But, the study of transbronchoscopic large volume lung lavage in the treatment of pneumoconiosis complicated with COPD is rare, and the effect is not clear. Based on this, the purpose of this study was to evaluate the efficacy of transbronchoscopic large volume lung lavage in the treatment of pneumoconiosis complicated with COPD. The following is the report.

1 Data & Methods

1.1 General materials

The clinical data of 80 patients with pneumoconiosis complicated with COPD admitted to our hospital from June 2017 to January 2019 were retrospectively analyzed. According to different treatment methods, the clinical data of 40 patients treated with conventional drugs were classified as the control group, and the clinical data of 40 patients treated with transbronchoscopic large-volume lung lavage were classified as the observation group. The control group consisted of 22 males and 18 females; aged 35-66 years, with an average of (46.12 ± 6.89) years; disease stage: 12 cases of stage I, 18 cases of stage II, and 10 cases of stage III; COPD severity: 9 cases were mild, 20 cases were moderate, and 11 cases were severe. The observation group consisted of 23 males and 17 females, aged 36-67 years, with an average age of (46.78 ± 7.01) years; disease stage: 13 cases in stage I, 16 cases in stage II, 11 cases in stage III; severity of COPD: 12 cases were mild, 17 cases were moderate, and 11 cases were severe. There was no significant difference in the basic data between the two groups (P>0.05), and the study was comparable.

1.2 The inclusion criteria

(1) Inclusion criteria: The diagnostic criteria of pneumoconiosis in the *Diagnostic Criteria of Pneumoconiosis*[3]; The diagnostic criteria of COPD in the guidelines for diagnosis and treatment of chronic obstructive Pulmonary Disease (Revised in 2007) [4]; Removal from the dust for more than 6 months; No serious diseases or dysfunction of important organs such as heart, brain, liver and kidney. (2) Exclusion criteria: Thehistory of mental illness and cognitive dysfunction; Coagulation dysfunction; Complicated active pulmonary tuberculosis.

1.3 Methods

1.3.1 Thecontrol group

Patientsin the control group received the routine drug treatment: inhaled salbutamol, oral theophyllines, thiotropium, inhaled corticosteroids/long-acting beta-agonists, and expectorants as needed aregiven according to COPD lung function classification.

1.3.2 Theobservation group

The transbronchoscopic large-volume lung lavage was performed on the basis of observation in the control group: Olympus BF-P150 electronic bronchoscope was used, and lavage was performed at 3, 5, and 7 days after admission. The bronchoscope was inserted transnasally and routinely examined, and an irrigation bottle with a volume of 20 mL was connected in the bronchoscope suction circuit to observe the colour of the lavage recovery fluid, which was normal saline at 37 ℃. As for a large volume lavage, 50 ml of lavage was performed each time, and negative pressure suction was performed with 0.2 mPa after injection, which was repeated until the lavage recovery fluid was clear or the lavage volume reached 3000 ml to stop the lavage operation. The right lung was lavaged on the 3rd day, the left lung was lavaged on the 5th day, and right and left lungs werelavaged at the same time on the 7th day. Routine oxygen inhalation was performed during operation, and high-frequency ventilation oxygen therapy was performed when necessary to maintain pulse saturation above 90%. After the operation, oxygen therapy was continued, physical expectoration therapy was performed, and aerosol inhalation of budesonide 4 ml was performed twice a day. All operations should

be performed under ECG, blood pressure, pulse oxygen saturation and respiratory monitoring. Both groups were followed up for 48 weeks after treatment.

1.4 Evaluation indicators

(1)Before treatment and at 12, 24 and 48 weeks after treatment, the severity of dyspnea recommended by the Medical Research Committee (MRC)[5] was used to evaluate the degree of dyspnea in the two groups. 0 point for no shortness of breath; 1 point for shortness of breath during strenuous exercise; 2 points for shortness of breath during stair climbing or etc; 3 points for shortness of breath during walking compared with their peers; 4 points for shortness of breath after walking for 90 m forced to stop activities; 5 points for shortness of breath when unable to leave the room or wear clothes. (2) Before treatment and at the 12th, 24th and 48th week after treatment, the healthy quality of life of the patients in the two groups was scored with George Respiratory problems questionnaire (SGRQ) [6]. The questionnaire has a total of 50 questions, which is divided into three parts, including symptoms, movement ability and the impact of the disease on daily life. The full score was 100, and the health status was negatively correlated with the score. Whether the individual score or the total score fluctuated by more than 4 points, the evaluation was completed independently by the subjects on the day of the pulmonary function test.

1.5 Statistical methods

SPSS 25.0 software was used for data processing, and *(x±s)* represents the measurement data. Theindependent sample t-test was used fordifferentgroups. Paired sample t-test was used within thesame group. Thedifferencewas considered statistically significant ($P < 0.05$).

2 Results

Comparison of dyspnea score between the two groups The dyspnea scores at the 12th, 24th and 48th week after treatment in the two groups were significantly lower than those before treatment, and the score of the observation group was lower than that of the control group, and the difference was statistically significant ($P < 0.05$), which can be seen in Table 1.

Table 1. Comparison of dyspnea scores between the two groups (*x±s*, *scores)*

Group	Before the treatment	The 12th week after the treatment	The 24th week after the treatment	The 48th week after the treatment
The control group (n=40)	3.06±0.62	2.25±0.16	2.29±0.18	2.38±0.18
The observation group (n = 40)	2.98±0.58	1.60±0.23	1.65±0.25	1.10±0.36
T	0.596	14.673	13.139	20.113
P	0.553	0.000	0.000	0.000

Score comparison of SGRQ between the two groups Scores of SGRQ at the 12th, 24th and 48th week after the treatment in the two groups were significantly lower than those before treatment, the scores of the observation group were lower, and the difference was statistically significant ($P < 0.05$), which can be seen in Table 2.

Table 2. Comparison of SGRQ scores between the two groups (*x±s*, scores)

Group	Before the treatment	The 12th week after the treatment	The 24th week after the treatment	The 48th week after the treatment
The control group (n=40)	49.73±2.14	46.73±2.14	47.90±2.14	47.28±2.18
The observation group (n = 40)	50.01±2.17	42.51±1.89	43.27±2.25	43.41±2.01
T	0.581	9.348	9.430	8.254
P	0.563	0.000	0.000	0.000

3 Discussion

Pneumoconiosis is an occupational disease, and its main pathogenic mechanism lies in the long-term inhalation of productive dust in the lung retention, resulting in diffuse fibrosis of lung tissue. The pathogenic dust and the unique pulmonary pathological changes of pneumoconiosis pull the small airway and increase the peripheral airway resistance, which is the main cause

of COPD, and some patients with pneumoconiosis also have a history of smoking, making patients with pneumoconiosis in a high risk to complicate with COPD, resulting in significant chest tightness, shortness of breath, cough, sputum and other symptoms, further reducing the quality of life of patients[7-8].

As an alternative treatment method for whole lung lavage, bronchoscope lung lobe or lung segment massive lavage has been widely used in patients with pulmonary alveolar proteinosis (PAP) with a total volume of 2,000 ml in a single lavage, mainly for the treatment of mild and severe PAP. For severe PAP patients who cannot tolerate whole lung lavage, selective transbronchoscopic large volume lung lavage can avoid exacerbating hypoxemia of PAP patients and achieve a clinical effect close to that of whole lung lavage[9-10]. The results of this study showed that the dyspnea score and SGRQ score of the observation group were lower than those of the control group at the 12^{th}, 24^{th} and 48^{th} week after the treatment, indicating that the effect of lung lavage with bronchoscopic large volume was better, which was helpful to alleviate the clinical symptoms of pneumoconiosis complicated with COPD and improve the quality of life. According to the analysis of the reasons, even after getting rid of the dust environment, the residual dust in the lungs of pneumoconiosis patients with COPD continues to interact with alveolar macrophages, which leads to the progression of pneumoconiosis. Conventional drug therapy can not completely remove the residual dust in the lungs of patients. The transbronchoscopic large-volume lung lavage can accurately remove bronchial inflammatory secretions and dust under the direct vision of bronchoscope, eliminate the airway obstruction. The large-volume normal saline lavage can remove dust and dust cells that remain in the alveoli and even pulmonary interstitium, and reduce the levels of inflammatory factors such as transforming growth factor-β 1, tumour necrosis factor-α and fibrogenic factors in patients' serum. It can improve the symptoms such as dyspnea caused by dust blocking to stop the progress of the disease, and further improve the quality of life of the patients.

To sum up, bronchoscopic large-volume lung lavage therapy can improve dyspnea and healthy quality of life in patients with pneumoconiosis complicated with COPD.

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