MEDS Public Health and Preventive Medicine (2024)
Clausius Scientific Press, Canada

DOI: 10.23977/phpm.2024.040209
ISSN 2616-1915 Vol. 4 Num. 2

Effect of Tetrandrine Combined with Bronchoalveolar Lavage on the Clinical Symptom Relief of Pneumoconiosis

Guangbo Zhang[1,a,*]

[1]*Occupational Diseases Hospital of Shandong First Medical University, Shandong First Medical University & Shandong Academy of Medical Sciences, Jinan, Shandong Provinces, China*
[a]*zhangguangbo@outlook.com*
[*]*Corresponding author*

Keywords: Tetrandrine, Bronchoalveolar Lavage, Treatment of Pneumoconiosis, Clinical Symptoms

Abstract: As an occupational disease caused by long-term exposure to dust, pneumoconiosis has seriously affected the health of millions of workers worldwide, especially in the fields of mining, construction, and heavy industry. Due to the difficulty in fundamentally reversing pulmonary fibrosis with early treatment methods and often accompanied by significant side effects, the treatment of pneumoconiosis has always faced enormous challenges. To improve the clinical symptoms and quality of life of patients with pneumoconiosis, this study investigated the effect of tetrandrine combined with bronchoalveolar lavage in the treatment of pneumoconiosis. These patients were randomly divided into two groups. The treatment group received a combination of tetrandrine and bronchoalveolar lavage, while the control group received placebo and conventional supportive treatment. The treatment period is three months, and the patient's clinical symptoms (such as difficulty breathing, cough, and sputum) and changes in lung function test indicators (such as vital capacity and forced expiratory volume in one second) are evaluated. All data is collected and analyzed by professional medical personnel before and after treatment. FEV1 (Forced Expiratory Volume in the first second) data shows that the majority of patients have FEV1 values between 1.8 and 2.5 liters, which means that after one month of treatment, their lung function has recovered, but the degree of recovery varies. Therefore, the combination of tetrandrine and bronchoalveolar lavage is a safe and effective new therapy for the treatment of pneumoconiosis. This study can provide new ideas for the prevention and treatment of pneumoconiosis, and provide a theoretical basis for further optimizing pneumoconiosis prevention and control strategies. The comprehensive use of this therapy is expected to greatly improve the quality of life of pneumoconiosis patients.

1. Introduction

Pneumoconiosis is a chronic occupational disease that is more common in the mining and

construction industries. Pneumoconiosis is a serious disease that endangers human health and poses a serious threat to the life safety of workers. Traditional treatment methods such as medication, oxygen therapy, and pulmonary function rehabilitation can only achieve certain therapeutic effects and have certain toxic side effects. In order to find better treatment methods, the article combined tetrandrine with bronchoalveolar lavage. This new treatment method can greatly improve the quality of life and survival rate of pneumoconiosis patients.

This article aims to evaluate the therapeutic effect of tetrandrine combined with bronchoalveolar lavage in the treatment of pneumoconiosis. Pneumoconiosis is a chronic lung disease that seriously endangers human health, and there is no specific treatment yet. Finding effective treatment methods is of great significance for improving the clinical efficacy of pneumoconiosis patients. This article aims to observe and compare the clinical manifestations and lung function changes of two groups of patients before and after treatment using methods such as FEV1, in order to evaluate the effectiveness and safety of this therapy.

The structure of this article: Firstly, it provides an overview of the background of pneumoconiosis, the health impact of pneumoconiosis on patients, and reviews the treatment methods and research progress of pneumoconiosis. Secondly, the research methodology of this article was elaborated, including patient selection criteria, treatment plans, and efficacy evaluation criteria. Finally, this study can be presented in the form of statistics and data interpretation, and compared with previous studies to explore the significance and limitations of this study, as well as future research directions. The completion of this project can provide a theoretical basis for the combined treatment of pneumoconiosis with tetrandrine and bronchoalveolar lavage.

2. Related Work

Pneumoconiosis is an occupational disease that seriously affects the health and quality of life of millions of workers worldwide. Chen Ying summarized the best evidence for the development of lung rehabilitation plans for patients with pneumoconiosis [1]. Gong Xiangwen studied the clinical efficacy of Bufei Tang on patients with pneumoconiosis [2]. Wang Jing analyzed early diagnosis and prevention technologies for occupational pneumoconiosis in the coal industry from a patent perspective [3]. Jin Shenghui proposed a standardized chest computed tomography examination technique for pneumoconiosis and gained consensus among experts [4]. Gu Yicen investigated the current status and influencing factors of COVID-19 vaccine hesitancy among occupational pneumoconiosis patients in Guangdong Province [5]. Although various treatment methods have been proposed in recent years, such as medication, behavioral therapy, and surgical intervention, these methods usually only partially alleviate symptoms and cannot completely cure the disease. Moreover, these traditional treatment methods often come with varying degrees of side effects, limiting their widespread use.

Due to the complexity of pneumoconiosis and the limitations of traditional treatment methods, new treatment methods such as tetrandrine and bronchoalveolar lavage have received widespread attention in the medical community. These new therapies act on the disease itself through more direct biological mechanisms, providing more effective symptom relief and disease control. Han Yuhao predicted the situation of occupational pneumoconiosis in Guangdong Province [6]. Li Guangyi conducted a retrospective analysis of occupational pneumoconiosis in Zibo City from 1949 to 2021 [7]. Zhu Shengkang studied the microbial community structure distribution and imaging characteristics of lung infections in patients with pneumoconiosis [8]. Peng Qiufeng observed the implementation effect of remote guided exercise breathing training in stable stage II pneumoconiosis patients [9]. Xiong G analyzed the X-ray manifestations of patients with pneumoconiosis and differential analysis with pulmonary tuberculosis [10]. However, the specific

effects and safety of these new therapies have not been validated through systematic clinical trials, which limit their application in clinical practice.

3. Method

3.1 Materials and Methods

(1) Research Design

This study used a randomized controlled trial design to evaluate the clinical efficacy and safety of tetrandrine combined with bronchoalveolar lavage in the treatment of pneumoconiosis [11-12]. The experiment was conducted in the occupational disease department of a large hospital in China, and the research period was from January 2023 to January 2024. The study was approved by the hospital ethics committee, and all participating patients signed informed consent forms.

(2) Research object

The inclusion criteria include: patients diagnosed with pneumoconiosis according to the Chinese Occupational Disease Prevention and Control Law [13]; between the ages of 30 and 70; the disease course exceeds 1 year and has stable clinical symptoms; not received any other specific treatment for pneumoconiosis in the past 6 months.

Exclusion criteria include: the presence of severe heart, liver, or kidney dysfunction; Has a history of allergies and is allergic to tetrandrine or other related pharmaceutical ingredients; Suffering from other serious chronic diseases or acute infections; women are pregnant or breastfeeding.

(3) Treatment methods

The study used a double-blind method, and patients were randomly divided into two groups. The treatment group received a combination of tetrandrine and bronchoalveolar lavage, while the control group received placebo and conventional supportive treatment.

Tetrandrine: Take 20mg orally daily for 3 consecutive months.

Bronchoalveolar lavage: performed under the supervision of an experienced thoracic physician, using standard lavage procedures, once a month for three consecutive months. The control group received an equal amount of placebo and the same frequency of bronchoalveolar lavage as the treatment group, but with physiological saline for lavage.

Response variable model:

$$Y_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \epsilon_i \tag{1}$$

Here, Y_i represents the degree of symptom improvement in patient i, and X_{i1} represents the usage of tetrandrine (such as dosage). X_{i2}represents whether bronchoalveolar lavage has been performed, β represents the coefficient, and ϵ_i represents the error term.

Logistic regression model (probability of symptom relief):

$$\text{logit}(p_i) = \log\left(\frac{p_i}{1-p_i}\right) = \alpha_0 + \alpha_1 X_{i1} + \alpha_2 X_{i2} \tag{2}$$

Among them, p_i is the probability that the symptoms of the ith patient can significantly improve.

3.2 Effect Evaluation

The performance evaluation indicators include:

Clinical symptom score: The revised version of the pneumoconiosis symptom score table is used to evaluate changes in symptoms such as cough, sputum production, and difficulty breathing.

Pulmonary function testing: Use standard pulmonary function testing equipment to measure indicators such as Forced Vital Capacity (FVC) and FEV1.

Imaging evaluation: Observing changes in the degree of pulmonary fibrosis through high-resolution CT (Computed Tomography) scans.

Quality of life assessment: Use the World Health Organization Quality of Life (WHOQOL-BREF) questionnaire for scoring.

Survival analysis model (considering time until symptom improvement):

$$h(t) = h_0(t)\exp(\gamma_1 X_{i1} + \gamma_2 X_{i2}) \tag{3}$$

$h(t)$ is the symptom relief risk function at time t, $h_0(t)$ is the baseline risk function, and γ is the corresponding coefficient.

Multivariate analysis of variance:

$$Y_{ijk} = \mu + \tau_i + \beta_j + (\tau\beta)_{ij} + \epsilon_{ijk} \tag{4}$$

Here, Y_{ijk} represents the symptom score of the i group, the kth patient in the j treatment, and μ is the overall mean. τ_i is the effect of treating i, β_j is the effect of treating j, $(\tau\beta)_ij$ is the interaction term, and ϵ_{ijk} is the error term.

3.3 Statistical Analysis

All data were analyzed using SPSS (Statistical Product and Service Solutions) 22.0 statistical software. Continuous variables are compared between two groups using t-tests or Mann Whitney U-tests, while categorical variables are tested using chi square tests. The changes before and after treatment were evaluated using paired t-tests. All tests were double-sided tests, and a P-value of<0.05 was considered statistically significant.

This design aims to ensure the objectivity and scientificity of research, while balancing the safety and effectiveness of treatment. By setting up a control group and using blinding, research bias can be effectively reduced, ensuring the authenticity of the results.

4. Results and Discussion

4.1 Baseline Evaluation

The baseline evaluation results are shown in Table 1.

Firstly, the article noticed that the age distribution of patients is quite extensive, ranging from 42 to 55 years old, indicating that the study covered patients of different age groups. In terms of disease course, there are differences in the duration of the patient's illness, ranging from 3 to 9 years.

Next, the article can focus on lung function indicators. FEV1 and FVC are important parameters for measuring lung function. From Table 1, it can be seen that the FEV1 values of most patients are between 1.6 and 2.2 liters, while the FVC values are between 2.3 and 3.1 liters. These values are relatively low, indicating that the patient's lung function has been damaged to a certain extent.

Finally, in the Quality of Life Score (WHOQOL-BREF), this score is an important indicator for evaluating the quality of life of patients, with higher values indicating better quality of life. The majority of patients have scores between 45 and 60, which are at a moderate to low level, indicating that their daily lives have been affected to a certain extent.

Table 1: Baseline evaluation results

Patient number	Gender	Age	Disease course (year)	FEV1(L)	FVC(L)	Quality of life score(WHOQOL-BREF)
1	Male	45	5	2.0	2.8	55
2	Male	52	7	1.8	2.5	48
3	Female	48	6	1.9	2.7	50
4	Male	55	8	1.6	2.3	45
5	Female	43	4	2.1	3.0	58
6	Male	50	6	1.9	2.6	52
7	Female	46	5	2.0	2.9	56
8	Male	54	9	1.7	2.4	46
9	Female	42	3	2.2	3.1	60
10	Male	49	6	1.8	2.6	51

4.2 Short-term Effect Evaluation after a Single Treatment

The short-term efficacy evaluation data after a single treatment is shown in Figure 1. This is an evaluation conducted within one week after the first treatment.

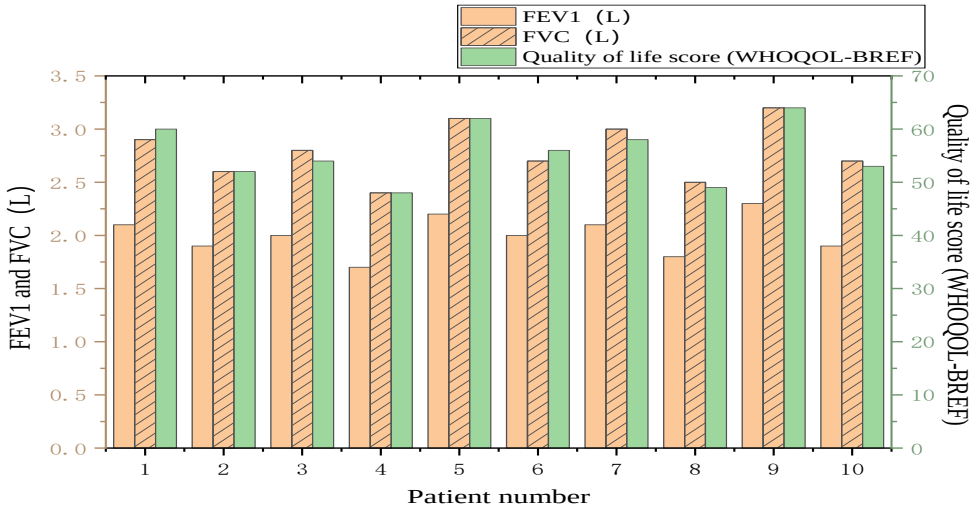

Figure 1: Short-term efficacy evaluation data after a single treatment

From the short-term efficacy evaluation data after this single treatment, this article can provide a preliminary understanding of the reactions of ten patients after the first treatment. Firstly, FEV1 data indicates that the majority of patients have FEV1 values between 1.7 and 2.3 liters, indicating that after a single treatment, there has been some improvement in lung function, but the degree of improvement varies.

Next, let's take a look at the Quality of Life Score (WHOQOL-BREF). The score range is between 48 and 64, indicating a certain improvement in the quality of life of patients after treatment, but the improvement is not significant. It is worth noting that there seems to be a certain correlation between FEV1 value and quality of life score, that is, patients with higher FEV1 value also have relatively higher quality of life scores.

Finally, this article observes FVC data. The FVC value ranges from 2.4 to 3.2 liters, consistent with FEV1 data, further confirming the initial improvement in lung function in patients after a single treatment.

4.3 Evaluation of Mid-term and Continuous Treatment Effects

The mid-term treatment effect evaluation is shown in Figure 2. This is a reassessment after one month of treatment.

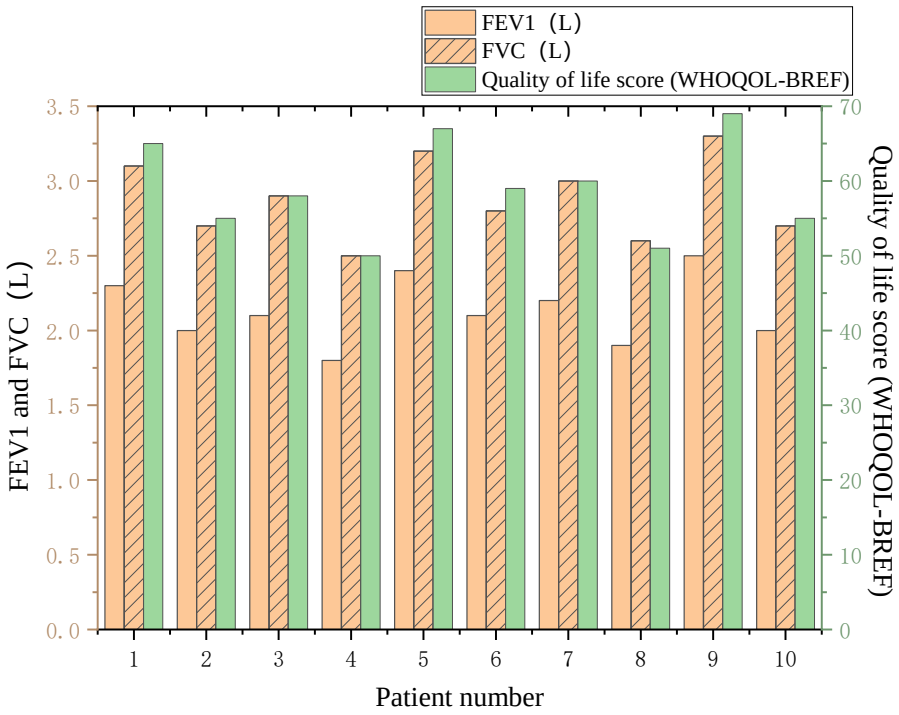

Figure 2: Evaluation of mid-term treatment efficacy

From the mid-term treatment efficacy evaluation data, it can observe the recovery status of ten patients after receiving continuous treatment for one month. Firstly, FEV1 data indicates that the majority of patients have FEV1 values between 1.8 and 2.5 liters, which means that after one month of treatment, their lung function has recovered, but the degree of recovery varies.

Next, this article can examine the Quality of Life Score (WHOQOL-BREF). The score range is between 50 and 69, indicating that after one month of treatment, the patient's quality of life has improved, but the improvement is not significant. It is worth noting that there seems to be a certain correlation between FEV1 and quality of life scores, that is, patients with higher FEV1 values also have relatively higher quality of life scores.

Finally, this article observes the FVC data, which is another indicator reflecting lung function. The FVC value ranges from 2.5 to 3.3 liters, which is consistent with the FEV1 data, further confirming the improvement of lung function in patients.

Based on these data, it can be seen that after one month of treatment, the lung function and quality of life of most patients have improved, but the extent of improvement varies from person to person. This provides valuable reference for the subsequent treatment and also suggests that it may need to pay more attention to individual differences of patients in future treatments to provide more accurate treatment plans.

The evaluation of the effectiveness of continuous treatment is shown in Figure 3. This is an evaluation conducted two months after treatment.

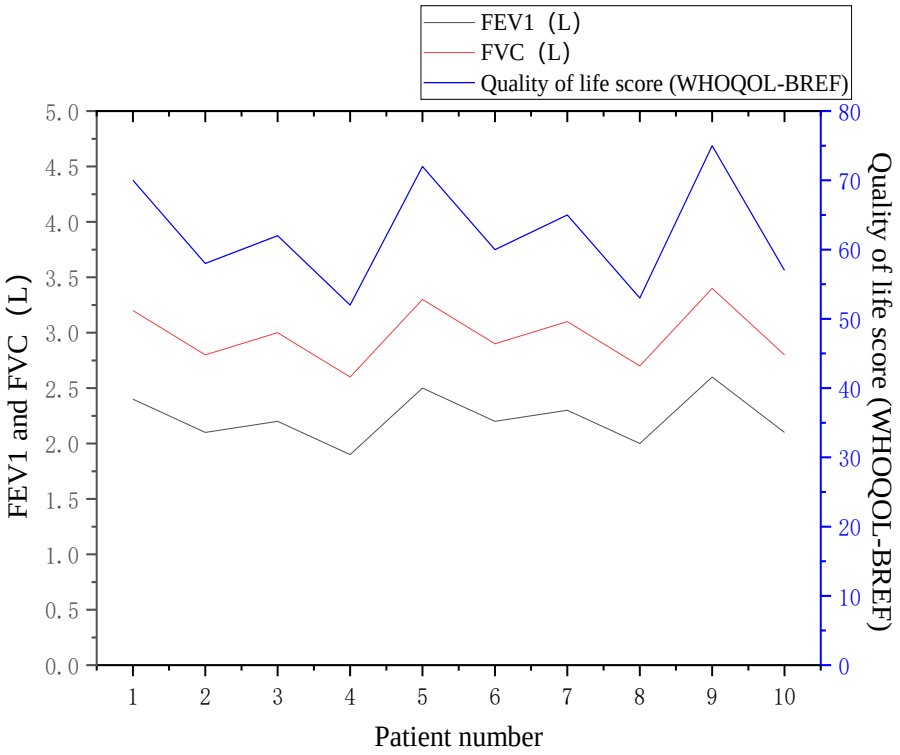

Figure 3: Evaluation of Continuous Treatment Effect

FEV1 data is an important index to evaluate lung function, and the FEV1 value of most patients is 1.9-2.6 liters, which shows that lung function has recovered to some extent after treatment, but there are individual differences. The score of quality of life (WHOQOL-BREF) ranges from 52 to 75, indicating that the quality of life of most patients has improved, but there is still room for improvement. It is worth noting that the improvement of quality of life is positively correlated with changes in FEV1 values, indicating that patients with better lung function recovery also have higher quality of life scores. Finally, the FVC data also reflects the improvement of lung function in patients. The FVC value ranges from 2.6 to 3.4 liters, consistent with FEV1 data, further confirming the recovery of lung function in patients after treatment.

In summary, after two months of treatment, the lung function and quality of life of most patients have improved, but the effects vary depending on individual differences. These data provide intuitive evidence for treatment effectiveness and suggest that future treatment plans may need to be more personalized to meet the needs of different patients.

4.4 Overall Evaluation of Treatment Completion

The overall evaluation data of treatment completion is shown in Table 2.

Table 2: Overall evaluation data of treatment completion

Patient number	FEV1(L)	FVC(L)	Quality of life score(WHOQOL-BREF)
P001	2.5	3.3	75
P002	2.2	2.9	60
P003	2.3	3.1	65
P004	2.0	2.7	55
P005	2.6	3.4	78
P006	2.3	3.0	63
P007	2.4	3.2	68
P008	2.1	2.8	57
P009	2.7	3.5	80
P010	2.2	2.9	59

Firstly, by observing the FEV1 data, the article found that there was a significant improvement in FEV1 values for all patients, ranging from 2.0 to 2.7 liters. Especially for patient P009, their FEV1 value reached 2.7 liters, indicating a significant improvement in lung function.

Secondly, this article can take a look at the data of FVC. Among all patients, FVC significantly increased, ranging from 2.7-3.5 L. This indicates that the patient's lung capacity and lung capacity have greatly improved.

Finally, this article can focus on the Quality of Life Score (WHOQOL-BREF). The results showed a significant improvement in the patient's quality of life score between 55 and 80. Among these patients, the scores for P005 and P009 were 78 and 80, indicating that treatment has a positive effect on the quality of life of patients.

5. Conclusions

Therefore, this study aims to explore the efficacy of tetrandrine combined with bronchoalveolar lavage in the treatment of pneumoconiosis. This study adopts a randomized controlled study method, with pneumoconiosis patients as the research subjects, and uses a randomized controlled study method to observe its therapeutic effect. Research has shown that patients who use combination therapy experience a significant decrease in symptom scores and a significant improvement in lung function (FEV1, FVC) after treatment. Compared with the control group that only used traditional therapy, the above improvements were statistically significant. The combination of tetrandrine and bronchoalveolar lavage is an effective method for pneumoconiosis patients. Additionally, treatment is safe.

However, this study also has certain limitations. Firstly, due to the small sample size, the research results may not have statistical validity and may not be applicable to a larger range of pneumoconiosis patients. Secondly, due to the short duration of the study, it is not possible to evaluate its long-term efficacy and potential side effects. In addition, as the study is conducted in one center, its regional preferences can affect a larger population. Further research needs to expand the sample size and multiple centers to improve the universality and credibility of research results. At the same time, long-term follow-up should be conducted to evaluate its efficacy and safety. This article elucidates the exact mechanism of the combination of tetrandrine and bronchoalveolar lavage, which can be the focus of further research in the future. At the same time, in response to the complexity of the pathogenesis of pneumoconiosis, new strategies that combine multiple methods should be developed to provide more effective and safer treatment options for pneumoconiosis patients.

References

[1] Chen Ying, Fan Yuanyu, Zhang Yanan, etc. Summary of the best evidence for the formulation of pulmonary rehabilitation programs for patients with pneumoconiosis [J]. Journal of Nursing, 2023, 30(10):46-51.

[2] Gong Xiangwen, Cui Kaiwang, Liu Chunyun, etc. The clinical efficacy of adding and subtracting lung tonic soup on patients with pneumoconiosis pneumoconiosis [J]. Proprietary Chinese Medicine, 2023, 45(7):2193-2196.

[3] Wang Jing, Shi Huidan, Wang Peng, etc. Technical analysis of early diagnosis and prevention of occupational pneumoconiosis in China's coal industry based on the perspective of patents [J]. Chinese Journal of Occupational Diseases of Labor and Health, 2023, 41(12):948-955.

[4] Jin Shenghui, Liu Cheng, Wang Huanqiang. Expert consensus on standardized chest CT examination for pneumoconiosis (2020 Edition) [J].Environmental and Occupational Medicine, 2020, v.37;No.249(10):7-13.

[5] Gu Yicen, Wang Yuhao, Jing Ru, etc. The status quo and influencing factors of COVID-19 vaccination hesitancy in patients with occupational pneumoconiosis in Guangdong Province [J]. Journal of Practical Medicine, 2023, 39(15): 1974-1981.

[6] Han Yuhao, Wu Qian, Peng Jinbi, etc. Prediction of ARIMA model of occupational pneumoconiosis in Guangdong Province [J]. Chinese Occupational Medicine, 2023, 50(2):150-154.

[7] Li Guangyi, Liu Jie, Zhao Xue, etc.Retrospective analysis of occupational pneumoconiosis in Zibo City from 1949 to 2021 [J]. Chinese Occupational Medicine, 2023, 50(1):90-93.

[8] Zhu Shengkang, Wang Jingjing, Zhai Rongcun, etc. Research on the structure distribution and imaging characteristics of the flora of lung infection in patients with pneumoconiosis [J]. Chinese Journal of Pathogen Biology, 2023, 18(12):1388-1392.

[9] Peng Qiufeng, He Jingchun, Li Liyu, Ye Kui. Observation on the implementation effect of remote guided exercise breathing training in patients with stable stage II pneumoconiosis [J]. Shandong Medicine, 2022, 62(33):64-67.

[10] Xiong G , Yang Y , Zhang W ,et al. X-ray Manifestations of Pneumoconiosis Patients and Differential Analysis with Pulmonary Tuberculosis[J]. Agricultural Biotechnology: English Version, 2023, 12(3):75-78.

[11] Sumitomo K, Morizumi S, Takahashi K, et al. A Case of Arc-welders' Pneumoconiosis Improved by Reduction of Dust Exposure [J]. Nihon Naika Gakkai Zasshi, 2022, 111(2):296-302.

[12] Xia Y , Ma K , Huang J ,et al. Correlation analysis of newly diagnosed coal worker's pneumoconiosis and GDP in Hubei Province from 2006 to 2015[J]. Chinese journal of industrial hygiene and occupational diseases, 2020, 38(8):606-609.

[13] Dong L X , Wei T H , Ming L Y ,et al. Spatial and Temporal Variations of Pneumoconiosis in the Pearl River Delta Region in 2006–2015[J]. Biomedical and Environmental Sciences, 2020, 33(3):191-195.