MEDS Clinical Medicine (2022)
Clausius Scientific Press, Canada

DOI: 10.23977/medsc.2022.030413
ISSN 2616-1907 Vol. 3 Num. 4

Efficacy Analysis of Levofloxacin Combined with Cefoperazone/Sulbactam Sodium in the Treatment of Adult Bronchiectasis Complicated with Infection

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Keywords: levofloxacin, cefoperazone/sulbactam sodium, bronchiectasis, infection, pulmonary function

Abstract: Objective: To investigate the efficacy of levofloxacin combined with cefoperazone/ sulbactam sodium in the treatment of bronchiectasis complicated with infection in adults and its effect on lung function. Methods About 200 patients with bronchiectasis and infection from May 2019 to July 2022 in Jintan First People's Hospital of Changzhou City, Jiangsu Province were selected and divided into 2 groups (100 cases in each group) according to the treatment plan. The control group received cefoperazone /sulbactam sodium treatment, the observation group was treated with levofloxacin on the basis of the above. The evaluation was conducted by comparing the time of improvement of clinical symptoms, the decrease of inflammatory indicators, and the improvement of lung function indicators. Results After treatment, the overall effectiveness rate of the observation group was 93%, and the control group was 78%, which was significantly different ($P<0.05$), cough and sputum production, body temperature recovery and hemoptysis stop time were all earlier than those in the control group ($P<0.05$). Prior to treatment, there was no significant difference in neutrophil values (GRAN), white blood cell count (WBC), and hypersensitive C-reactive protein (CRP) between the two groups ($P>0.05$). After treatment, the GRAN, WBC and CRP of the control group were significantly higher than those in the observation group ($P<0.05$); there was no significant difference in forced expiratory volume (FVC), forced expiratory volume in 1 second (FEV1), FEV1/FVC between the two groups before treatment ($P>0.05$), After treatment, the FVC, FEV1, FEV1/FVC values in the observation group were significantly higher than those in the control group ($P<0.05$). Conclusion The application of levofloxacin combined with cefoperazone/sulbactam sodium can effectively improve the clinical symptoms, inflammation level and pulmonary function indexes of adult bronchiectasis complicated with infection.

1. Introduction

Bronchiectasis is a bronchial irreversible and pathological dilation due to a series of factors. The prevalence is approximately 1.2% in people over the age of 40 in China, and it increases gradually

with age [1]. Moreover, bronchiectasis can significantly reduce patients' quality of life and increase the hospitalization rate and mortality. Therefore, how to effectively treat bronchiectasis has also become one of the focuses of clinical research.

During bronchiectasis, chronic inflammatory reaction will damage the bronchial elastic tissue and muscle, causing irreversible expansion and deformation of the lumen, further causing sputum dryness and destruction of ciliary clearance function, which is more suitable for the colonization of various pathogens [2], so the main thing is to control the infection during treating bronchiectasis. Due to the use of antibiotics is in a wide range, as well as the emergence of resistant strains, single antimicrobials often fail to meet expectations. Therefore, this study analyzed 200 patients with bronchiectasis complicated by infection collected from Jintan First People's Hospital of Changzhou City, Jiangsu Province, to explore the therapeutic effect of levofloxacin on the basis of cefoperazone/sulbactam sodium treatment.

2. Materials and methods

2.1 General information

A total of 200 patients with bronchiectasis and infection who were admitted to Jintan First People's Hospital of Changzhou City, Jiangsu Province from May 2019 to July 2022 were selected. The patients were divided into two groups, observation group and control group with 100 cases in each group, because of different clinical treatment methods. The observation group included 52 males and 48 females, aged 52-88 years, with an average of (73.37±8.93) years, and the disease duration was 1-16 years, with an average of (8.76±2.15) years. The control group consisted of 48 males and 52 females, aged 41-94 years, mean (72.65±12.41) years, 1-15 years, mean (8.48±2.09) years. There were no statistically significant differences between the two groups in gender, average age, and disease duration ($P>0.05$).

2.2 Inclusion and exclusion criteria

Inclusion criteria: (1) age ≥ 18 years; (2) meet the requirements of "Diagnostic Criteria for Bronchiectasis"; (3) bacterial infection in sputum culture; (4) patients voluntarily participate and sign informed consent. Exclusion criteria: (1) using antibacterial drugs for less than 14 days in this study; (2) patients with severe heart, liver and kidney dysfunction; (3) allergic to the drugs in this study; (4) patients with medium or higher hemoptysis and high fever.

2.3 Treatment

Control group: Intravenous infusion of cefoperazone/sulbactam sodium (Shandong Luoxin Pharmaceutical Group Co., Ltd., H20059959), the dose of 1.5g was added to 100mL of normal saline for adequate dilution, intravenous infusion, q8h treatment, Continuous treatment for 14d. On the basis of the above administration, the observation group was given levofloxacin hydrochloride (Yangtze River Pharmaceutical Group Co., Ltd., H20060026) intravenously, the dose of 0.1 g was added to 100 mL of normal saline to fully dilute, q12h treatment, and continuous treatment for 14d.

2.4 Efficacy criteria

According to the curative effect standard of bronchiectasis in "Respirology" [3]: (1) Cure, clinical symptoms such as cough and expectoration, elevated body temperature, and hemoptysis have all disappeared, and sputum bacteriological examination, imaging examination, and laboratory

indicators are all normal. And the lung function index increased by more than 15%; (2) markedly effective, the main clinical symptoms of the patient all or basically disappeared, only one sputum examination, imaging examination, and laboratory index did not completely return to normal, and the pulmonary function index increased by 10% %—15%; (3) Effective, the main clinical symptoms of the patient have been significantly improved, two of the above tests have completely returned to normal, and the pulmonary function indicators have improved; (4) Ineffective, the above criteria have not been met, and even the disease has worsened. Total effective rate = cured rate + markedly effective rate + effective rate.

2.5 Observation indicators

A fully automatic analyzer (AU5800) was used to detect the neutrophil count (GRAN), white blood cell count (WBC), and high-sensitivity C-reactive protein (CRP) of patients, and analyze their changes before and after treatment. The kit was produced by Sysmex; A functional tester (RSFJ1000) was used to detect forced expiratory volume (FVC), forced expiratory volume in 1 second (FEV1), and changes in FEV1/FVC levels.

2.6 Statistical processing

The data was entered into SPSS21.0 for statistical analysis, the count data was expressed by rate, and the χ^2 test was performed; the measurement data was expressed by $\bar{x}\pm s$, and the t-test was performed, and $P<0.05$ indicated that the difference was statistically significant.

3. Results and analysis

3.1 Comparison of total efficiency

The total effective rate of the observation group after treatment was 93% higher than that of the control group, 78%, with statistical significance (2=9.074, P<0.05), see Table 1.

Table 1: The total effective rate between the two groups after treatment

	Cases(n)	Cured rate	Markedly effective rate	Effective rate	Ineffective rate	Total effective rate
observation group	100	15(15.00)	36(36.00)	42(42.00)	7(7.00)	93(93.00)
control group	100	10(10.00)	27(27.00)	30(30.00)	10(10.00)	78(78.00)
χ^2						9.074
P						0.03

3.2 Comparison of clinical symptoms

Collect and analyze the clinical symptoms recovery time of the two groups of patients. The restore time of clinical symptoms (cough and expectoration, body temperature and hemoptysis) between two groups has significant difference after the treatment (P<0.05). See Table 2.

Table 2: Clinical symptoms between the two groups after treatment

	Cases(n)	Cough and sputum recovery time (t/d)	Temperature recovery time (t/d)	Haemoptysis recovery time (t/d)
control group	100	8.91±1.92	5.91±1.64	3.87±1.75
observation group	100	6.38±1.51	4.27±1.09	2.13±0.93
t		10.366	8.328	8.782
P		0.000	0.000	0.000

3.3 Comparison of inflammatory indexes

Before treatment, there were no significant differences in white blood cell count (WBC), neutrophil count (GRAN), and high-sensitivity C-reactive protein (CRP) between two groups (P>0.05). After treatment, there were significant changes in inflammatory indexes in the two groups (P<0.05), and WBC, GRAN, and CRP in the observation group were significantly lower than those in the control group, with statistical differences (t values were 5.969, 5.235, and 5.306, P<0.05). See Table 3.

Table 3: Inflammatory indexes before and after treatment in the two groups

	Cases	WBC ($\times10^9$/L)				GRAN ($\times10^9$/L)				CRP (mg/L)			
		Before treatment	After treatment	t	P	Before treatment	After treatment	t	P	Before treatment	After treatment	t	P
control group	100	12.21±2.16	6.90±1.51	17.481	0.000	10.79±3.87	5.01±1.41	12.157	0.000	37.26±8.36	17.17±4.28	14.385	0.000
observation group	100	12.76±2.24	5.50±1.36	24.047	0.000	10.99±3.55	3.87±1.26	16.352	0.000	37.69±9.07	10.25±3.36	19.056	0.000
t		1.542	5.969			0.323	5.235			0.244	5.306		
P		0.125	0.000			0.747	0.000			0.808	0.000		

3.4 Changes of pulmonary function

It was determined that there was no statistically significant difference between the three indicators of pulmonary function (FVC, FEV1, FEV1/FVC) between the two groups before treatment (P>0.05). After treatment, the pulmonary function of both groups was improved (P<0.05), and the observation group has greater improvement range of the indexes (P<0.05). See Table 4.

Table 4: Pulmonary function in the two groups after treatment

	Cases	FVC(L)				FEV_1(L)				FEV_1/FVC			
		Before treatment	After treatment	t	P	Before treatment	After treatment	t	P	Before treatment	After treatment	t	P
control group	100	2.53±0.33	3.26±0.32	-15.57	0.000	1.47±0.27	2.10±0.37	-13.635	0.000	0.58±0.03	0.62±0.05	-7.049	0.000
observation group	100	2.45±0.32	3.42±0.43	-18.230	0.000	1.52±0.34	2.28±0.44	-13.728	0.000	0.59±0.05	0.67±0.05	-10.980	0.000
t		1.859	-3.066			-1.083	-3.166			-1.642	-6.801		
P		0.064	0.002			0.280	0.002			0.102	0.000		

4. Conclusions and Discussion

Bronchiectasis is the irreversible dilation of medium-sized bronchi caused by infection, immunodeficiency and other reasons [4]. Repeated infection can lead to chronic inflammation. The clinical manifestations are often accompanied by cough, thick sputum, and elevated body temperature. High, hemoptysis, etc. [5]. The further deterioration of bronchiectasis can also lead to chronic pulmonary heart disease and chronic obstructive pneumonia (COPD), and 50% of COPD patients are also accompanied by bronchiectasis [6]. The more severe damage to the structure, the prognosis is often poor [7].

Common treatments for bronchiectasis include health management and appropriate exercise, especially in smokers [8]. However, when bronchiectasis is complicated by bacterial infection, the treatment is particularly important. According to research, the pathogenic bacteria in patients with bronchiectasis and infection are mainly gram-negative bacteria, among which Pseudomonas

aeruginosa is the most, accounting for 47.83%, and it has very strong drug resistance [9]. The reason for the drug resistance of Pseudomonas aeruginosa is that the genes encoding extended-spectrum β-lactamases (ESBLs) are detected in its genes, thereby releasing β-lactamase hydrolase, resulting in the bacteria becoming resistant and promoting Antibacterial drugs lose their antibacterial efficacy [10]. According to research[11], β-lactam antibiotics can be used as the preferred antibiotics for Pseudomonas aeruginosa, among which cefoperazone/sulbactam sodium has the highest sensitivity to Pseudomonas aeruginosa. Cefoperazone is a third-generation cephalosporin antibiotic that binds to PBPs on the cell membrane and inhibits cell wall synthesis. Sulbactam sodium is a semi-synthetic β-lactamase inhibitor, and it has obvious antibacterial synergy when used in combination with cephalosporins. Levofloxacin is a fluoroquinolone drug with broad-spectrum antibacterial effect, which has good antibacterial effect on Gram-negative bacteria, Gram-positive bacteria, anaerobic bacteria, β-lactam-resistant bacteria, etc. The combined use of ketone/sulbactam sodium can significantly enhance the antibacterial effect.

CRP is a non-specific inflammatory marker, which can indicate the occurrence of inflammatory response and the use of antibiotics [12]. WBC and neutrophil values can also indicate the occurrence of bacterial infection and inflammatory response, which are positively correlated with CRP. Through the above clinical studies, after treatment, the neutrophils, WBC, and CRP levels of the two groups of patients were significantly decreased, and the decrease in the observation group was significantly greater than that in the control group. The results showed that both treatment regimens had significant antibacterial effects. The antibacterial effect of levofloxacin combined with cefoperazone/sulbactam sodium was significantly better than that of the latter alone.

FVC, FEV_1, and FEV_1/FVC are the main indicators for evaluating lung function [13]. The results of this study showed that after treatment, the FVC, FEV_1, and FEV_1/FVC of the two groups were significantly improved. The results confirmed that controlling and reducing the inflammatory response in patients with bronchiectasis can significantly improve the symptoms of airflow limitation and help improve lung function. The results also found that the improvement of lung function indexes in the observation group after treatment was better than that in the control group. The results show that the combined use of levofloxacin has a stronger effect on improving the lung function of patients with bronchiectasis than the non-combination use. The possible reason is that levofloxacin combined with cefoperazone/sulbactam sodium can significantly improve the antibacterial effect, and its mechanism of action needs to be further studied.

In conclusion, levofloxacin combined with cefoperazone/sulbactam sodium has definite curative effect in the treatment of bronchiectasis complicated with infection, has significant antibacterial effect, can significantly relieve clinical symptoms, reduce inflammatory response, and improve lung function, which is worthy of clinical application and promotion.

References

[1] Yumin Zhou, Chen Wang,Wanzhen Yao, et al. Investigation on the disease and risk factors of bronchiectasis in residents aged 40 and above in 7 provinces and cities in China [J]. Chinese Journal of Internal Medicine,2013, 52(5): 379-382.

[2] Li Yuling, Xing Fangyuan, Chen Jing, et al. Correlation between the incidence of years of onset in elderly patients with bronchiectasis and Pseudomonas aeruginosa infection and bronchial asthma [J]. Chinese Journal of Gerontology, 2015(3): 643-645.

[3] Liu Youning,Chen Liang'an. Respiratory disease [J]. National Medical Journal of China,2002, 82(24): 1659-1660.

[4] Liu Xuedong, Zhao Weiye, Zhang Shuli, et al. Research progress of bronchiectasis in adults [J]. Chinese Journal of Tuberculosis and Respiratory Diseases,2020, 43(10): 902-905.

[5] Gao, Yonghua, Guan Weijie, Liu Shaoxia, et al. Aetiology of bronchiectasis in adults: A systematic literature review [J]. Respirology :2016, 21(8): 1376-1383.

[6] Hu Siyu, Long Fa, Long Liang, et al. Clinical efficacy and safety analysis of thermoplasty in the treatment of patients with severe asthma and asthma chronic obstructive pulmonary disease[J]. Chinese Journal of Internal Medicine,2021,

101(15): 1071-1076.
[7] Pan Jing, Lu Jinchang. Clinical features of COPD complicated with bronchiectasis and related factors [J]. Journal of Clinical Pulmonary Medicine, 2019, 24(9): 1645-1650.
[8] JAMES D CHALMERS, PIETER GOEMINNE, STEFANO ALIBERTI, et al. The bronchiectasis severity index. An international derivation and validation study. [J]. American journal of respiratory and critical care medicine, 2014, 189(5): 576-585.
[9] Du Lijun, Dong Qiong. The distribution of pathogens in patients with bronchiectasis and lung infection and the effect of susceptibility test results on the application of antibacterial drugs [J]. Medical & Pharmaceutical Journal of Chinese People's Liberation Army,2022, 34(2): 66-69.
[10] Qin Kejun, Cao Xianqin, Chen Paiqiang, et al. Clinical distribution and resistance mechanism of Pseudomonas aeruginosa [J]. Journal of Pathogen Biology, 2021, 16(2): 224-227.
[11] Guo Xiaofang. Analysis of resistance of Pseudomonas aeruginosa to β-lactam antibiotics [J]. Sichuan Journal of Physiological Sciences, 2019, 41(1): 15-17.
[12] Wang Yueping, Yin Feifei, Zhao Guohou, et al. Expression levels and significance of serum CRP, IL-6, and PCT in bronchiectasis complicated with pulmonary infection [J]. Chinese Journal of Nosocomiology, 2020, 30(9): 1350-1354.
[13] Liu Hongmei, Wuyun Gaowa. Evaluation of lung function in patients with chronic obstructive pulmonary disease with bronchiectasis [J]. Chinese Journal of Community Physicians, 2020, 36(36): 112-113.