APPLICATION OF TIOTROPIUM BROMIDE, PULMICORT RESPULES AND VANTOLIN IN PATIENTS WITH COPD AND EMPHYSEMA AND ITS EFFECT ON LUNG FUNCTION

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ABSTRACT

Objective: *To analyse the application of tiotropium bromide, Pulmicort Respules and Ventolin in patients with chronic obstructive pulmonary disease (COPD) complicated with emphysema, along with its effect on lung function.*

Methods: *A total of 98 patients with COPD and emphysema treated in our hospital from January 2015 to January 2018 were enrolled in the study. They were randomly assigned into an observation group and a control group, 49 patients per group. The control group was treated with Pulmicort Respules and Ventolin, and the observation group was treated with tiotropium bromide, Pulmicort Respules and Ventolin. After treatment, the difference in clinical efficacy, time to disappearance of clinical symptoms (such as wheezing, coughing, fever, dry and wet rales), length of hospital stay, lung function (FEV1, FVC, FEV1 / FVC) and blood gas analysis (PaO2, PaCO2, SaO2, pH) were compared between the two groups.*

Results: *After treatment, the total effective rate was 93.87% in the observation group, much higher than the control group's 81.63, a statistically significant difference (P<0.05). Symptoms for the patients in the observation group, such as wheezing, coughing, fever, and dry and wet rales, disappeared in a shorter time; patients in this group also exhibited a shorter length of hospital stay than those in the control group. The difference between the two groups was statistically significant (P<0.05). Before treatment, no significant difference was noted in FEV1, FVC and FEV1/FVC between the two groups (P>0.05). After treatment, FEV1, FVC and FEV1/FVC in both groups were significantly higher than before treatment, and those in the observation group showed statistically significant higher levels than the control group (P<0.05). Before treatment, no statistical difference in PaO2, PaCO2, SaO2 and pH could be seen between the two groups (P>0.05). After treatment, PaCO2 in both groups was significantly lower than before treatment, and that in the observation group was significantly lower than for those in the control group (P<0.05). Moreover, the levels of PaO2, SaO2 and pH were significantly higher than before treatment, and those in the observation group showed significantly higher levels than the control group, a statistically significant difference (P<0.05).*

Conclusions: *Tiotropium bromide, Pulmicort Respules and Ventolin can improve the lung function and blood gas indicators of COPD patients with emphysema.*

Keywords: *Tiotropium bromide, Pulmicort Respules, Ventolin, chronic obstructive pulmonary disease, emphysema, lung function.*

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Introduction

Chronic obstructive pulmonary disease (COPD), a chronic disease of the respiratory system, is characterized by continuous airflow limitation and airflow obstruction. The age of onset is more than 40 years old, and the incidence is 8% to 9%. The inflammatory response is also related to harmful gases and restricted airflow(1). Typical symptoms include cough, sputum, chest tightness, shortness of breath and difficulty breathing, etc. Pulmonary emphysema is a pathological response of airway wall injury due to excessive expansion of the distal bronchioles of the airway, associated with bronchial obstruction and protease-antiprotease imbalances. The typical symptoms of this disorder are decreased appetite, weight loss, barrel-like chest, etc., and a complication is obstructive emphysema(2). Tiotropium bromide is an anticholinergic bronchodilator that inhibits tracheal contraction (caused by the release of acetylcholine

from the parasympathetic nerve ends) by binding to the muscarinic receptors of the bronchial smooth muscle[3]. Pulmicort Respules is an inhalation suspension, which can repair the airway by inhibiting airway hyperresponsiveness and has a strong anti-inflammatory effect[4]. Ventolin is mainly used to alleviate COPD as it has a significant bronchodilating effect[5]. In clinical practice, patients with COPD and emphysema are often treated with nebulization inhalation. In this study, we investigated the application of tiotropium bromide, Pulmicort Respules and Ventolin in treating patients with COPD and emphysema, along with its effect on lung function.

Materials and methods

General data

A total of 98 patients with COPD and emphysema treated in our hospital from January 2015 to January 2018 were recruited for the study, and they were randomly divided into an observation group and a control group, 49 patients per group. In the observation group were 20 males and 29 females aged from 46 to 80 years, with a mean age of (69.3±5.4) years, having a disease course of 7-9 years and a mean disease course of (8.4±1.6) years.

In the control group were 23 males and 26 females aged from 45 to 82 years, with a mean age of (68.7±5.6) years, with a course of disease of 6-8 years and a mean disease course of (7.5±1.4) years.

Inclusion criteria comprised the following:

• Patients who were consistent with the diagnosis of COPD;

• FEV1 between 30% and 50%;

• Normal blood gas analysis;

• Patients aged from 45 to 83 years;

• Patients with good compliance.

Exclusion criteria were as follows:

• Patients with other complications;

• Patients with liver and kidney dysfunction;

• Or patients with a mental disorder and poor compliance.

The patients and their families signed an informed consent form, and the study was approved by the local ethics committee. No significant difference was seen in general data such as gender, age and disease course between the two groups (P>0.05).

Methods

The observation group were given Pulmicort Respules (AstraZeneca Australia Ltd, batch number: X20150614, dosage specification: inhalation suspension, 1mg/2ml), 1 to 2mg once daily, 1ml saline, twice daily. Ventolin (Suzhou GSK Pharmaceutical Co., Ltd, batch number: J20160074, dosage specification: aerosol, 100μg * 200 presses) 100μg, 2 presses, 4 times a day. Tiotropium bromide (Zhejiang Xianjing Pharmaceutical Co., Ltd, batch number: H20160324, dosage specification: inhalation, 18μg * 10s) 1 capsule per time, once a day. The three were mixed for aerosol inhalation.

The control group was given Pulmicort (1~2mg, once a day), normal saline (1ml, twice a day) and Ventolin (100μg, 2 presses, 4 times a day). On this basis, both groups were given basic treatments such as oxygen therapy, anti-infection and doxofylline.

Observation indexes and efficacy evaluation

Marked effect

The patient's respiratory symptoms improved significantly, dry and wet rales basically disappeared, without chest tightness, shortness of breath, and so on; effective: cough and sputum saw some improvement and difficult breathing significantly alleviated; no effect: the patient's respiratory symptoms did not improve or even worsened. Total effective rate = (marked effect + effective)/total number of the patients × 100%.

Pulmonary function was measured using Japan Mino AS-507 pulmonary function tester.

Blood gas analysis was performed using a blood gas analyser from Shanghai Zhongmingkang Medical Equipment Co., Ltd.

Statistical analysis

All data were analysed using the software SPSS 20.0. The measurement data were expressed as mean ± standard deviation, and a t-test was used to compare the data for the observation group and the control group.

The count data were expressed as the rate (%), and the comparison between the observation group and the control group was analysed using a χ^2 test. The difference was defined as statistically significant when P was <0.05.

Results

Clinical efficacy

After treatment, the total effective rate was 46 (93.87%) in the observation group, which was much higher than the control group's 40 (81.63%), a statistically significant difference (P<0.05). See Table 1.

Group	n	Marked effect	Effective	No effect	Total effective rate (%)
Observation group	49	36 (73.46)	10 (20.40)	3 (6.12)	46 (93.87)
Control group	49	11 (22.44)	13 (26.53)	9 (18.36)	40 (81.63)
χ^2					1.365
P					0.043

Table 1: Comparison of clinical efficacy between the two groups [n (%)].

Time for symptoms' disappearance and length of hospital stay

The patients in the observation group displayed a shorter time for the disappearance of symptoms such as wheezing, coughing, fever, and dry and wet rales, as well as a shorter length of hospital stay than those in the control group. The difference between the two groups was statistically significant (P<0.05).

Group	Wheezing	Cough	Fever	Rales	Length of hospital stay
Observation group (n=49)	5.23±2.64	7.85±1.34	2.33±0.21	5.38±1.68	8.01±1.92
Control group (n=49)	8.36±3.64	9.89±2.43	3.68±0.46	7.69±1.44	11.32±2.36
t	4.872	5.146	18.688	7.307	7.615
p	<0.001	<0.001	<0.001	<0.001	<0.001

Table 2: Time of symptoms' disappearance and length of hospital stay for the two groups ($\bar{x}\pm s$, d).

Comparison of lung function

Before treatment, no significant difference was evident in FEV1, FVC and FEV1/FVC between the two groups (P>0.05). After treatment, FEV1, FVC and FEV1/FVC in both groups were significantly higher than before treatment, with those in the observation group showing statistically significant higher values than the control group (P<0.05). See Table 3.

Group	FEV_1 (L)		FVC (L)		FEV_1/FVC (%)	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Observation group (n=49)	0.82± 0.32	1.21± 0.41*	1.42± 0.32	2.42± 0.42*	33.52± 9.61	52.32± 14.74*
Control group (n=49)	0.71± 0.31	0.91± 0.34*	1.51± 0.43	1.92± 0.53*	33.61± 9.52	43.41± 13.15*
t	1.728	3.942	1.175	5.175	0.046	3.157
p	0.087	<0.001	0.242	<0.001	0.963	0.002

Table 3: Comparison of lung function between the two groups ($\bar{x}\pm s$).
*Note: compared with the same group before treatment *P<0.05.*

Blood gas analysis

Before treatment, no statistical difference in PaO2, PaCO2, SaO2, and pH was seen between the two groups (P>0.05). After treatment, PaCO2 in both groups was significantly lower than before treatment; moreover, the observation group showed a significantly lower level than the control group (P<0.05). In addition, the levels of PaO2, SaO2 and pH were significantly higher than before treatment, and those in the observation group showed higher levels than the control group, a statistically significant difference (P<0.05). See Table 4.

Group	PaO2 (mmHg)		PaCO2 (mmHg)		SaO2 (%)		pH value	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Observation group (n=49)	54.33± 5.31	69.86± 5.99*	58.32± 5.21	49.71± 4.54*	72.66± 6.48	82.35± 6.12*	7.28± 0.07	7.41± 0.08*
Control group (n=49)	55.42± 5.28	64.67± 6.42*	58.64± 5.35	53.92± 4.98*	72.64± 6.52	78.34± 5.68*	7.27± 0.06	7.33± 0.04*
t	1.018	4.137	0.300	4.373	0.015	3.361	0.759	6.261
p	0.310	<0.001	0.764	<0.001	0.987	<0.001	0.449	<0.001

Table 4: Comparison of blood gas analysis between the two groups ($\bar{x}\pm s$).
*Note: compared with the same group before treatment *P<0.05.*

Discussion

The aetiology of COPD is not clear, and research suggests that it is closely related to the occurrence of obstructive emphysema. Its manifestations include chronic cough and sputum, and the patient often presents with cough and sputum discharge in the morning as well as nocturnal cough. The sputum is serous foamy or white mucous. The patient may also develop purulent bloodshot sputum in the acute stage[6]. The main symptom of COPD is progressive aggravation of dyspnoea. Patients may have slight dyspnoea during exercise at an early stage, which gradually becomes severe in later stages, and some patients may experience worse dyspnoea such as wheezing and chest tightness[7].

Patients with COPD exhibit signs that include diminished breathing sounds in both lungs along with dry and wet rales, and pursed-lip breathing may occur in severe cases[8]. Related disease factors may include respiratory infection, smoking, air pollution and others. Genetics, lung dysplasia, etc. can also give rise to the disease. Emphysema is associated with bronchial obstruction and protease-antiprotease imbalance. The early stage is not characterized by any obvious symptoms. With the progression of the disease, dyspnoea can gradually worsen, and the

patient may develop symptoms such as weight loss and fatigue. Emphysema typically manifests in the form of a barrel chest. X-ray typically shows an increase in the anterior and posterior diameter of the thorax; in addition, the transillumination of the two lung fields increases, the posterior sternum space widens, the rib slope becomes smaller and the chest cage is rounded[9]. Due to the increase in the number of smokers in China, the incidence of COPD combined with emphysema is increasing annually, and it has become the fourth highest cause of fatal disease in China. In general, patients are given oxygen, education aimed at smoking cessation, and therapy to strengthen respiratory function, but the effect is minimal[10]. Researchers have demonstrated that anti-inflammatory therapy, symptomatic therapy and keeping the airway open are key in the treatment of COPD combined with emphysema. Therefore, exploring the application of tiotropium bromide, Pulmicort Respules and Ventolin in treating patients with COPD and emphysema along with the effect of such treatments on lung function is currently a hot topic in clinical research.

Tiotropium bromide is a specific selective anticholinergic bronchodilator that works by inhibiting smooth muscle M3 receptors and dilating bronchi, which has a significant effect on improving lung function and dyspnoea[11]. Pulmicort Respules is an inhalation suspension that can strongly bind to glucocorticoids; thus, it can repair the airway by inhibiting airway hyperresponsiveness and has a strong anti-inflammatory effect[12]. Ventolin can alleviate the symptoms of bronchospasm in patients with COPD, and it can strongly dilate bronchi, reduce bronchospasm and improve patient mobility[13]. In addition, it can inhibit the proliferation of tracheal smooth muscle cells, reduce the activity of smooth muscle neutrophils, mitigate airflow restriction and improve lung function[14]. Tiotropium bromide, Pulmicort Respules and Ventolin can effectively alleviate dyspnoea in patients with COPD, and in combination, they can speed up the onset time without tolerance[15]. The results of this study showed that the total effective rate for the observation group was significantly higher than that of the control group; in particular, the time of symptoms' disappearance and the length of hospital stay were much shorter in the observation group than for those in the control group. Additionally, compared with the control group, FEV1, FVC and FEV1/FVC for those in the observation group were much higher, PaCO2 was significantly decreased, and PaO2, SaO2 and pH were much higher. These results show that tiotropium bromide, Pulmicort Respules and Ventolin have a significant effect on treating patients with COPD and emphysema while making a positive difference in lung function.

In summary, tiotropium bromide, Pulmicort Respules and Ventolin can improve pulmonary function and blood gas indexes in patients with COPD and emphysema, deserving to become more common in clinical practice.

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