



Efficacy of budesonide in treatment of acute exacerbation of chronic obstructive pulmonary disease

Xue-Dong Chen*, Jun Wei, Jun-Qing Ren, Xue-Fen Shuai, Ling Cheng, Dong-Gen Wu, Wei Wei, Jun Sun

Department of Respiratory Medicine, People's Hospital of Xuancheng City, Anhui, 242000, China

ARTICLE INFO

Article history:

Received
Received in revised form
Accepted
Available online

Keywords:

Budesonide
Chronic obstructive pulmonary disease
Acute exacerbation
Clinical efficacy

ABSTRACT

Objective: To explore the clinical efficacy of budesonide in the treatment of acute exacerbation of chronic obstructive pulmonary disease (AECOPD). **Methods:** A total of 60 patients with moderate and severe AECOPD who were admitted in our hospital from January, 2015 to January, 2016 were included in the study and randomized into the experiment group and the control group. The patients in the two groups were given oxygen inhalation, anti-infection, phlegm dispersing, ipratropium bromide (0.5 mg/time), and aerosol liquid of salbutamol sulfate (2.5 mg/time), 3 times/d, 20 min/time, aerosol inhalation. The patients in the experiment group were given budesonide (2 mg/time), while the patients in the control group were given budesonide (1 mg/time), every 8 h for one aerosol inhalation. The patients in the two groups were continuously treated for 7 d. The changes of PaO₂, PaCO₂, FEV₁, and FEV₁/FVC before and after treatment were detected, and the efficacy was evaluated. **Results:** After treatment, PaO₂ and PaCO₂ in the two groups were significantly improved when compared with before treatment, and the improved degree in the observation group was significantly superior to that in the control group. After treatment, FEV₁ and FEV₁/FVC in the two groups were significantly improved when compared with before treatment, and the improved degree in the observation group was significantly superior to that in the control group. The total effective rate in the observation group (93.33%) was significantly higher than that in the control group (76.67%). **Conclusions:** Aerosol inhalation of budesonide in the treatment of AECOPD in a large dose for a short term can significantly improve the blood gas and pulmonary function.

1. Introduction

Chronic obstructive pulmonary disease (COPD) is a kind of disease with incomplete and reversible airway limitation, and is progressively developed, with manifestations of repeated cough, expectoration, wheeze, and short of breath caused by many factors[1,2]. Acute exacerbation of chronic obstructive pulmonary disease (AECOPD) is characterized by airway stenosis, mucosa edema, and increased secretions, which can cause hypoxia and carbon dioxide retention to give rise to respiratory failure and damaged pulmonary function, thus endangering the patients'

life[3]. High speed inhalation is mainly involved in the treatment of AECOPD in the clinic in that their airway is characterized by non-specificity and hyperreactivity. In recent years, some researches demonstrate that aerosol inhalation of budesonide in the treatment of AECOPD has a preferable clinical efficacy; therefore, it can replace the systemic hormone treatment[4]. The study is aimed to explore the clinical efficacy of aerosol of budesonide in a different dose in the treatment of AECOPD.

2. Materials and methods

2.1. General materials

A total of 60 patients with moderate and severe AECOPD who were admitted in our hospital from January, 2015 to January, 2016 were included in the study and randomized into the experiment

*Corresponding author: Xue-Dong Chen, Department of Respiratory Medicine, People's Hospital of Xuancheng City, Anhui, 242000, China.
Tel: 13515635128
E-mail: cxd13515635128@sina.com
Foundation project: The study was supported by the Scientific Research Project of People's Hospital of Xuancheng City in Anhui Province with the number of 201516.

group and the control group. In the experiment group, there were 30 cases, among which 17 were male, and 13 were female; aged from 65 to 78 years old, with an average age of (73.7±6.7) years old. In the control group, there were 30 cases, among which 16 were male, and 14 were female; aged from 66 to 78 years old, with an average age of (73.8±7.1) years old. The comparison of the general materials between the two groups was not statistically significant ($P>0.05$).

2.2. Inclusion and exclusion criteria

Inclusion criteria: (1) those who were in accordance with the diagnostic criteria of AECOPD in the Diagnosis and Treatment Guideline of COPD[5]; (2) those who had signed the informed consent. Exclusion criteria: (1) those who had severe respiratory failure in need of mechanical ventilation, bronchial asthma, pulmonary fibrosis, pulmonary embolism, pulmonary tuberculosis, respiratory tumors, severe heart, liver, and renal insufficiency, hypertension, and diabetes; (2) those who were allergic to related drugs; (3) those who had taken glucocorticoids in recent 2 months.

2.3. Methods

The patients in the two groups were given oxygen inhalation, anti-infection, phlegm dispersing, ipratropium bromide (0.5 mg/time), and aerosol liquid of salbutamol sulfate (2.5 mg/time), 3 times/d, 15-20 min/time, aerosol inhalation. The patients in the experiment group were given budesonide (2 mg/time), while the patients in the control group were given budesonide (1 mg/time), every 8 h for one aerosol inhalation. The patients in the two groups were continuously treated for 7 d.

2.4. Observation indicators

The full automatic blood gas analyzer was used to detect PaO₂, PaCO₂, FEV1, and FEV1/FVC before and after treatment, and the clinical efficacy in the two groups was evaluated[5]. Excellent: the clinical symptoms were completely disappeared, and dyspnea was significantly improved; effective: the symptoms of cough, expectoration, and wheeze were significantly alleviated, rale was reduced, and dyspnea was improved; invalid: the clinical symptoms were not significantly improved or aggravated.

2.5. Statistical analysis

SPSS 18.0 software was used for the statistical analysis. The

measurement data were expressed as mean±SD, and *t* test was used. Chi-square test was used for the enumeration data. $P<0.05$ was regarded as statistically significant difference.

3. Results

3.1. Comparison of PaO₂ and PaCO₂ before and after treatment

After treatment, PaO₂ after treatment in the two groups was significantly elevated when compared with before treatment ($P<0.05$), while PaCO₂ was significantly reduced ($P<0.05$), and the improved degree in the observation group was significantly superior to that in the control group ($P<0.05$) (Table 1).

3.2. Comparison of FEV1 and FEV1/FVC before and after treatment

After treatment, FEV1 and FEV1/FVC in the two groups were significantly elevated when compared with before treatment ($P<0.05$), and the improved degree in the observation group was significantly superior to that in the control group ($P<0.05$) (Table 2).

3.3. Comparison of the efficacy

After treatment, in the observation group, 18 (60.0%) were excellent, 10 (33.33%) were effective, and 2 (6.67%) were invalid, and the total effective rate was 93.33%. In the control group, 12 (40.0%) were excellent, 11 (36.67%) were effective, and 7 (23.33%) were invalid, and the total effective rate was 76.67%. The difference between the two groups was statistically significant ($P<0.05$).

4. Discussion

The prevalence rate of COPD in individuals greater than 40 years old in China is more than 8.2%. Each year about 1000,000 people will die due to COPD. Most COPD patients are characterized by progressive aggravation, airway stenosis, strong elasticity, and high cilium motor ability, which can easily cause respiratory mucosa congestion and sticky sputum; therefore, the clinical treatment is extremely high with poor effect and many patients will finally die of AECOPD due to obvious dyspnea[6,7].

COPD is characterized by chronic inflammation of airway and

Table 1

Comparison of PaO₂ and PaCO₂ before and after treatment (mmHg, mean±SD).

Groups	n	PaO ₂		PaCO ₂	
		Before treatment	After treatment	Before treatment	After treatment
Observation	30	50.65±2.48	79.45±5.71 [#]	61.75±4.25	48.41±2.35 [#]
Control	30	51.17±2.59	72.24±4.59*	61.42±5.35	53.56±2.17 [*]

* $P<0.05$, when compared with before treatment; # $P<0.05$, when compared with the control group.

Table 2

Comparison of FEV1 and FEV1/FVC before and after treatment (mean±SD).

Groups	n	FEV1(L)		FEV1/FVC(%)	
		Before treatment	After treatment	Before treatment	After treatment
Observation	30	1.02±0.41	1.45±0.51 [#]	55.78±5.28	63.47±3.51 [#]
Control	30	1.01±0.39	1.21±0.48 [*]	55.47±5.35	58.75±4.72 [*]

* $P<0.05$, when compared with before treatment; # $P<0.05$, when compared with the control group.

pulmonary parenchyma, and increased inflammatory cells. After activation, the inflammatory cells can release the inflammatory mediators to damage the pulmonary structure. Some researches demonstrate that glucocorticoids can inhibit the activation of inflammatory cells and the release of cytokines[8]. Glucocorticoid can reduce the infiltration of tracheal inflammatory cells and mucous secretions, and its value of systemic application in the treatment of AECOPD has been fully affirmed in the clinic[9]. The elder individuals are prone to suffer from COPD, with frequent acute onset, thus a repeated applications of glucocorticoids for a short time is often required; however, the accumulation of adverse reactions due to repeated administration will cause osteoporosis, dysglycemia, and immunosuppression, which can severely affect the living qualities; therefore, it's especially important to search a treatment method which can replace the systemic glucocorticoids[10].

Budesonide belongs to the adrenocortical hormone of the second generation, characterized by higher glucocorticoid receptor binding capacity, high lipophilicity, and appropriate water solubility, can produce obvious anti-inflammation, anti-allergy, and glandular secretion reduction effects, and is applied in the treatment of bronchial asthma and COPD as an inhaled glucocorticoid, with a satisfactory effect in the clinic. It is argued that aerosol inhalation of budesonide in a full dose can produce a rapid anti-inflammation effect through cytoplasm hormone receptor and cytomembrane hormone receptor[11]. Aerosol inhalation of budesonide can combine with the intracellular glucocorticoid receptors, effectively inhibit the formation of cytokines, restrain the synthesis and release of prostaglandin and leukotriene, interfere arachidonic acid metabolism, reduce the airway hyperresponsiveness, and alleviate the airway edema[12]. Ipratropium bromide has a higher selectivity to the bronchial smooth muscle, can effectively block the bronchial constriction caused by vagus nerve cholinergic fiber, and can produce a preferable effect in an extremely low dose due to its few absorption by the mucous membrane[13]. Some researches demonstrate that budesonide can take a rapid effect 3h after aerosol inhalation, and can effectively alleviate the symptoms of COPD and asthma at an acute exacerbation, with a confirmed efficacy[14]. It is found by Maltais et al[15] that budesonide in the treatment of AECOPD, 2 mg/time, 4 time/d, for continuous 3 d can earlier improve the clinical symptoms, and has an equal efficacy to prednisone (30 mg) in improving the dyspnea; moreover, it will not induce the change of serum cortisol level. It is reported by Gao et al[3] that the combined inhalation of budesonide (2 mg/time) and ipratropium bromide for 1 week can better alleviate the clinical symptoms than in a low dose, with no obvious increasement of adverse reactions. It is argued that aerosol inhalation of budesonide in the treatment of AECOPD in a double dose can significantly enhance the efficacy, and reduce or replace the application of systemic hormone.

The results in the study showed that after treatment, PaO₂ and PaCO₂ in the two groups were significantly improved when compared with before treatment ($P<0.05$), and the improved degree in the observation group was significantly superior to that in the control group ($P<0.05$); after treatment, FEV₁ and FEV₁/FVC in the two groups were significantly improved when compared with before treatment ($P<0.05$), and the improved degree in the observation group was significantly superior to that in the control group ($P<0.05$); the total effective rate in the observation group (93.33%) was significantly higher than that in the control group

(76.67%) ($P<0.05$), suggesting that aerosol inhalation of budesonide in a large dose has a better clinical effect than in a small dose, which is consistent with related references[16].

The combined aerosol inhalation of budesonide and ipratropium bromide in the treatment of AECOPD can produce a synergistic effect, and can effectively reduce the airway resistance, and improve hypoxemia and ventilation function. A higher concentration of hormones is required in order to trigger a rapid effect which is associated with the hormone concentration; therefore, it is recommended that budesonide in a large dose in the treatment of AECOPD is taken in order to more rapidly alleviate the clinical symptoms.

References

- [1] Shi WX, Lin YX, Zhu JG, et al. Analysis of risk factors of secondary fungus infection in patients with AECOPD. *China Med* 2016; **11**(1): 34-37.
- [2] Xu YB. Clinical observation on the efficacy of Tanreqing injection in combined with montelukast sodium in the treatment of AECOPD. *Chin J Med* 2014; **49**(2): 53-54.
- [3] Gao JX, Zhou XM. Observation on the efficacy of aerosol inhalation of budesonide in a different dose in combined with ipratropium bromide in the treatment of AECOPD. *J Cardiovas Pulmon Dis* 2013; **32**(5): 573-575.
- [4] Huang LR. Efficacy of aerosol of budesonide in combined with seretide in the treatment of COPD merged with infection. *Clin Focus* 2015; **30**(1): 57-60.
- [5] Zhang XH. Clinical significance of detection of inflammatory cytokine levels to COPD. *J Hainan Med Coll* 2016; **22**(3): 240-242.
- [6] Han J, Zhang W. Study on the efficacy of Feishu particle in the treatment of AECOPD through the airway inflammatory cytokines. *China J Tradit Chin Med Pharm* 2013; **28**(7): 2202-2204.
- [7] Cui JR. Effect of neutrophil/lymphocyte on the poor prognosis in elder patients with AECOPD. *J Hainan Med Coll* 2016; **22**(2): 129-132,137.
- [8] Wang SL, Chen GY. Observation on the efficacy of glucocorticoid in the treatment of AECOPD. *Ningxia Med J* 2014; **36**(5): 424-426.
- [9] Fu KL, Lin K. Observation on the clinical efficacy of acupoint application in the treatment of 80 cases with COPD. *J Tradit Chin Med* 2015; **56**(11): 948-952.
- [10] Liu CW, Jiang DL, Yu FM. Effect of NIPPV in combined with drugs on the serum and sputum inflammatory cytokines in patients with AECOPD. *Chin J Pract Med* 2015; **42**(23): 29-30.
- [11] Xu JC, Zhang RF. Comparison of the efficacy of aerosol inhalation of budesonide suspension in a different dose in the treatment of moderate and severe AECOPD. *Modern Pract Med* 2013; **25**(1): 29-31.
- [12] Wang TB. Efficacy of Tanreqing injection in the treatment of AECOPD. *Chin J Pract Med* 2015; **42**(17): 32-33.
- [13] Zhang AR. Clinical value of the combined detection of serum PCT and hs-CRP to AECOPD. *Chin J Pract Med* 2015; **42**(12): 124-125.
- [14] Xu JF. Efficacy of Lifei Huatan Yuying decoction in the treatment of 30 cases with AECOPD. *Tradit Chin Med Res* 2015; **28**(6): 38-40.
- [15] Tian Y. Study on the correlation of infection in AECOPD patients with serum TNF- and CR3. *Chin Foreign Med Res* 2015; **13**(36): 25-27.
- [16] Pan J, Li HP, Xu XH, et al. Observation on the efficacy of aerosol inhalation of budesonide in a different dose in the treatment of AECOPD. *China Pharm* 2014; **23**(7): 63-64.