Pakistan J. Zool., vol. 54(3), pp 1443-1445, 2022 **DOI**: https://dx.doi.org/10.17582/journal.pjz/20191101181135

Short Communication

Effect of Inhalation of Low-Dose Budesonide Powder Combined with Pulmonary Rehabilitation in the Treatment of Bronchial Asthma

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Article Information
Received 01 November 2019
Revised 12 January 2020
Accepted 04 February 2020
Available online 31 May 2021
(early access)
Published 04 March 2022

Authors' Contribution
NJ and GT proposed the research and wrote the manuscript. NJ, TL and JL treated different groups of patients. NJ and TL adopted the experimental data for comparative analysis.

Key words
Inhalation of budesonide powder, Pulmonary rehabilitation, Bronchial asthma, Mechanism of action

ABSTRACT

The objective of this study was to observe and analyze the effects of inhalation of low-dose budesonide powder combined with pulmonary rehabilitation in the treatment of bronchial asthma, and to explore the mechanism of action. In this study, 180 patients who had been diagnosed and treated for bronchial asthma in our hospital were enrolled as research objects. They were divided into experimental group accepting inhalation of low-dose budesonide powder combined with pulmonary rehabilitation and control group accepting conventional drug therapy. The therapeutic effects of the two groups were compared. Compared with the control group (77.78%), the overall treatment effective rate of was significantly higher in the experimental group (94.44%), $p<0.05$. The improvement degree of pulmonary function in the experimental group was more significant than that in the control group, $p<0.05$. Observing asthma symptom scores of the patients in the two groups, it was found that the asthma symptom scores of the experimental group were significantly lower 2 months and 6 months of treatment, than those of the control group, $p<0.05$. It is conducted that inhalation of low-dose budesonide powder combined with pulmonary rehabilitation therapy in patients with bronchial asthma can significantly improve the therapeutic effect, which is worthy of promotion and application.

Bronchial asthma is a heterogeneous disease characterized by chronic airway inflammation involving multiple cells (eosinophils, mast cells, T lymphocytes, neutrophils, airway epithelial cells, etc.) and cellular components (Ozdemir, 2020). This chronic inflammation is associated with airway hyperreactivity, usually with extensive and variable reversible expiratory airflow restriction, leading to recurrent episodes of wheezing, shortness of breath, chest tightness, and/or cough, with varying intensity over time (Zou, 2017). Most bronchial asthma attacks and exacerbations occur at night and/or in the early morning, and most patients can spontaneously relieve or be relieved by treatment (Park *et al*., 2016).

At present, there are many effective drug treatments for bronchial asthma. Glucocorticoids have a very significant application effect in terms of anti-immunity and anti-inflammation. Through inhalation therapy, they can act locally on patients without serious adverse reactions (Shimoda *et al*., 2017). However, long-term inhalation of large amounts of glucocorticoids can easily lead to sinusitis, respiratory tract infection and other conditions (Liu *et al*., 2017). Inhalation of low-dose budesonide powder combined with pulmonary rehabilitation in the treatment of bronchial asthma (Wang *et al*., 2018) is evaluated in this study.

Materials and methods

In this study, 180 patients who had been treated for bronchial asthma in our hospital from January 2016 to May 2019 were enrolled as experimental subjects. All patients passed the clinical comprehensive examination and met the diagnostic criteria of bronchial asthma in the guidelines for the prevention and treatment of bronchial asthma for enrolling in study and considering congenital heart disease, bronchial foreign body and other respiratory diseases, and patients with serious organ dysfunction and mental disorders as exclusion criteria (Fu, 2018).

The patients were randomly divided into experimental group and control group, each containing 90 cases. There were 50 male patients and 40 female patients in

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0030-9923/2022/0003-1443 $ 9.00/0

Table I. Comparison of pulmonary function indicators between the two groups ($\bar{x}$ ±s).

Group	FEV1(L)		FVC(L)		FEV1/FVC		PEF	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Experimental group	1.4±0.2	1.9±0.5	2.2±0.3	2.9±0.1	62.39±10.28	74.55±13.20	58.2±1.3	78.9±2.0
Control group	1.4±0.7	1.5±0.3	2.3±0.6	2.4±0.8	62.93±9.36	65.80±12.37	57.6±1.4	66.5±2.5
t	0.29	4.59	0.11	6.58	0.20	5.32	0.14	5.90
p	>0.05	<0.05	>0.05	<0.05	>0.05	<0.05	>0.05	<0.05

FEV1, forced expiratory volume in 1 second; FVC, forced volume capacity; PEF, peak expiratory flow.

Table II. Comparison of overall treatment effective rate between the two groups [n (%)].

Group	Significant effective	Effective	Ineffective	Overall treatment effective rate
Experimental group(n=90)	50	35	5	85(94.44)
Control group(n=90)	40	30	20	70(77.78)
X2				10.29
p				<0.05

Table III. Comparison of asthma symptom scores between two groups ($\bar{x}$ ±s).

Group	Number of cases	Before treatment	2 months after treatment	6 months after treatment
Experimental group	90	1.958±0.046	0.240±0.011	0.239±0.057
Control group	90	1.980±0.036	0.456±0.039	0.399±0.063
X2		0.18	5.70	9.31
p		>0.05	<0.05	<0.05

the experimental group, respectively, with an average age of (46.7±2.1) years and an average course of disease of (5.2±0.6) years. In contrast, there were 48 male patients and 42 female patients in the control group, respectively, with an average age of (47.3±2.8) years and an average course of disease of (5.5±0.9) years. There were no significant differences in general data between two groups, p>0.05.

Patients in the control group were given routine medication. During asthma attack, patients were instructed to oral administration of prednisone (5 mg, once a day); theophylline controlled-release tablets (0.2g, twice a day); and inhaled salbutamol aerosol (200μg, three times a day). During the remission phase, no medication was given. Patients in the experimental group were treated with low-dose budesonide inhalation therapy. Patients inhaled budesonide powder fog before sleep. Patients in the asthma attack were inhaled with salbutamol aerosol (200 mg, three times a day). Both groups were treated for one year. Patients in the experimental group were given pulmonary rehabilitation based on the instruction provided on the study of Schultz *et al*. (2017). After treatment, the pulmonary function indexes of the two groups were observed and compared. Forced expiratory volume (FEV1), forced expiratory volume (FVC), FEV1/FVC and peak expiratory velocity (PEF) were counted. The overall treatment effective rate was observed and the score of asthma symptoms was calculated. Statistical analysis software SPSS21.0 was used to process data. The measurement data were expressed by mean ± average ($\bar{x}$± s), with t test conducted for intergroup comparison. Enumeration data were expressed by natural (n) and percentage (%), with X2 used for intergroup comparison. The intergroup difference is of statistical value when P<0.05.

Results and discussion

Table I shows the comparison of pulmonary function indicators between two groups. The improvement effect of pulmonary function indicators in the experimental group was more significant, p<0.05.

Table II, The overall treatment effective rate of the

experimental group was higher than that of the control group, $p<0.05$.

Table III shows symptom scores of the patients in the experimental group after treatment were significantly better than those before treatment, and there was a significant difference with the control group, $p<0.05$.

Bronchial asthma is a common and frequent occurring disease. Once it cannot be treated timely and effectively, it will endanger the life safety of patients. Practical experience has shown that the single implementation of drug treatment for bronchial asthma patients, the results are not uniform, so it is usually to take comprehensive therapy (Eric *et al*., 2018; Zou *et al*., 2018). Remission type drugs (short-acting oral β2 agonists, short-acting theophylline, inhaled anticholinergic agents, etc.) are used to relieve bronchospasm symptoms (Zou *et al*., 2018).

Budesonide is a highly effective local anti-inflammatory glucocorticoid that enhances the stability of lysosomal membrane, smooth muscle cells and endothelial cells, inhibits immune response and reduces antibody synthesis, and weakens the activity and release of allergenic agents (Practical, 2019). Budesonide can weaken the enzymatic stimulation during the binding of antigens and antibodies, and block the release and synthesis of bronchoconstrictor substances, so as to reduce the contraction response of smooth muscle (Shin *et al*., 2019; Hakim *et al*., 2019; Tashkin *et al*., 2019). It is widely used in the treatment of glucocorticoid-independent bronchial asthma, as well as the treatment of dependent bronchial asthma and asthmatic chronic bronchitis. A small dose of budesonide powder aerosol for inhalation therapy can quickly deliver the drug to the airway surface of patients, promote the absorption of the drug and reduce the rate of adverse reactions, so it has a reliable safety (Janson *et al*., 2019).

Conclusion

In conclusion, inhalation of low-dose budesonide powder combined with pulmonary rehabilitation therapy in patients with bronchial asthma can significantly improve the therapeutic effect and positively improve the pulmonary function.

Statement of conflict of interest

The authors have declared no conflict of interest.

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