Effect of Aerosol Inhalation of Budesonide Suspension on Clinical Efficacy, Remission Time of Asthma and Disappearance Time of Rales in Children with Mycoplasma Pneumoniae Pneumonia

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To investigate the effect of aerosol inhalation of budesonide suspension on clinical efficacy, remission time of asthma and disappearance time of rales in children with mycoplasma pneumoniae pneumonia. Methods: 100 cases of mycoplasma pneumoniae pneumonia in our hospital from February 2019 to February 2021 were randomly divided into study group (n = 50) and control group (n = 50). The control group was given azithromycin intravenous drip followed by oral treatment, and the study group was given aerosol inhalation of budesonide suspension on the basis of the control group. Results: Compared with the control group, disappearance time of rales in the study group, remission time of cough, remission time of asthma and time of hospitalization in the study group were relatively short (P<0.05), and the efficacy in the study group was relatively high (P<0.05). There was no significant difference in the incidence of nausea, vomiting, abdominal pain, diarrhea and hoarseness between the two groups (P>0.05). The improvement of FVC、FEV1 and PEF and other indexes was relatively high in the study group by comparing with the control group (P<0.05). Conclusion: Aerosol inhalation of budesonide suspension in children with mycoplasma pneumoniae pneumonia can effectively enhance the therapeutic effect, promote the improvement of lung function, and reduce the disappearance time of rales and remission time of asthma, so it can be popularized.

Keywords: Budesonide suspension; Aerosol inhalation therapy; Children patients with mycoplasma pneumoniae pneumonia; Clinical efficacy; Remission time of asthma; Disappearance time of rales;
Tob Regul Sci.™ 2021;7(5-1): 3057-3062
DOI: doi.org/10.18001/TRS.7.5.1.75

Mycoplasma pneumoniae pneumonia in children is a clinically common type of respiratory disease, most of which occur in infancy [1]. The main clinical features of this disease are headache, sore throat, cough and shortness of breath. If the child cannot be treated in a scientific and reasonable way in time, it will further cause multi-organ and multi-system damage, which will greatly threaten the life and health of the child [2]. Currently, the clinical symptoms of the patients are effectively relieved by using macrolide antibiotics, fluid infusion, fever relief and sedation, but the survival quality of children with mycoplasma pneumoniae pneumonia may be adversely affected to some extent due to the delayed and difficult cure and repeated disease conditions [3]. Therefore, at present, the key to clinical treatment of such diseases is to find a kind of drug as soon as possible, which can avoid repeated diseases and has an ideal curative effect. This study was designed to investigate the effect of aerosol inhalation of budesonide suspension on clinical efficacy,

remission time of asthma and disappearance time of rales in children with mycoplasma pneumoniae pneumonia. It was reported as follows.

DATA AND METHODS

General data

From February 2019 to February 2021, 100 children with mycoplasma pneumoniae pneumonia admitted to our hospital were randomly divided into two groups. Inclusion criteria: ① The patients participating in this study fully complied with the diagnosis criteria of such diseases in "Zhufutang Practical Pediatrics"; ② The patients did not have severe immunodeficiency disease and could cooperate with relevant treatments normally; ③ The patients did not have a history of intolerance to inhaled drugs and did not develop systemic infection within the first two weeks of treatment. Exclusion criteria: ① The child received other test items before participating in this study and took the drugs that may significantly affect the study results; ② The child had allergy to the drugs used in this study; ③ The child had respiratory tract infection caused by other factors and had severe abnormalities in heart, kidney and lung function. In the control group, there were 50 cases, including 31 males and 19 females, aged 2-10 years, with a mean age of (5.2 ± 0.6) years, and the disease duration was 2-4 days, with a mean age of (2.3 ± 0.5) years. In the study group, there were 50 patients, 30 males and 20 females, aged 3-9 years, with a mean age of (5.3 ± 0.5) years, and the disease duration was 1-5 days, with a mean age of (2.2 ± 0.6) years. And the data were comparable (P>0.05).

METHODS

1.2.1 The control group was given azithromycin intravenous drip followed by oral treatment. Azithromycin (SFDA Approval No. H10960167; specification: 0.25g * 4s; Pfizer Pharmaceutical Co., Ltd.) 10 mg was dissolved in glucose solution with concentration of 5%, and the child patient was given intravenous drip of the drug, once daily for 3-5 days, then the child patient was given oral azithromycin, at a dose of 10 mg/time, once daily for 3 days. Then the child patient was given symptomatic treatment with drugs such as anti-tussive, expectorant and antipyretic drugs.

1.2.2 The study group was given aerosol inhalation of budesonide suspension on the basis of the control group. Dissolve 1 mg budesonide (SFDA Approval No. H20010551; specification: 200 ug,100 actuations; Shanghai Xinyi Bailuda Pharmaceutical Co.,Ltd.) into 2 ml ~ 3 ml 0.9% sodium chloride injection solution, mix it well, complete the aerosol inhalation treatment via disposable aerosol mask driven by oxygen, the patient needs to receive twice daily treatment.

Observation indicators

1.3.1 Observe and analyze the improvement of clinical symptoms and hospital stay in the two groups.

1.3.2 Observe and analyze the therapeutic effect of the two groups. Significant effect: After treatment, the body temperature of the child has gradually reached normal level, pulmonary rales and inflammation in the lungs have been completely eliminated, and about 90% of pulmonary lesions have been completely absorbed after X-ray examination; effective: After treatment, the body temperature of the child's body temperature decreases by more than 1 ℃ and gradually returns to normal level, and various adverse symptoms such as cough, shortness of breath and headache have been greatly relieved. After X-ray examination, it was found that about 80% of the lung lesions had been completely absorbed, and the abnormal condition of the lesions was significantly improved; ineffective: The child still had adverse symptoms like high fever after treatment, and after X-ray examination, only about 20% of the lung lesions were completely absorbed, and the disease condition gradually became serious [4]. Total effective rate = significant efficiency + effective rate.

1.3.3 Observe and analyze the incidence rate of adverse reactions in the two groups.

1.3.4 The FVC, FEV1 and PEF of the two groups were observed and analyzed. The peak expiratory flow (PEF), forced expiratory volume in 1 second (FEV 1) and forced vital capacity (FVC)

before and after treatment were measured by spirometry. Specific method: Guide the patient to perform deep breathing exercises for a certain period of time, until it has made a detailed mastery on the relevant steps of test, then it is necessary to make repeated measurement for 3 times, and then take the average value of several times as the final result [5,16].

Statistical processing

The data were analyzed by SPSS 18.0, where the counts were tested by X^2 (%) and the values were measured by t test ($\bar{x}\pm s$), P<0.05 indicated significant difference.

RESULTS

Comparison of clinical symptom improvement and hospital stay

Compared with the control group, the disappearance time of rales, the remission time of cough, the remission time of asthma and the time of hospitalization in the study group were relatively short (P<0.05). See Table 1.

Table 1.
Improvement of clinical symptoms and hospital stay ($\bar{x}\pm s$, d)

Group	Number of cases	Remission time of asthma	Disappearance time of rales	Remission time of cough	Time of hospitalization
Control group	50	3.5±0.9	5.4±0.8	7.1±1.5	9.5±2.3
Study group	50	2.3±0.6	3.9±0.5	4.6±1.3	7.2±1.9
t value	/	16.156	16.237	16.696	16.653
P value	/	＜0.05	＜0.05	＜0.05	＜0.05

Treatment efficacy comparison

Compared with the control group, the efficacy of the study group was relatively high (P<0.05). See Table 2.

Table 2
Therapeutic efficacy (n, %)

Group	Number of cases	Produce effect	Effective	Ineffective	Overall response rate (%)
Control group	50	25	10	15	35（70.0）
Study group	50	32	15	3	47（94.0）
X^2 value	/	6.563	6.571	6.612	6.539
P value	/	＜0.05	＜0.05	＜0.05	＜0.05

Comparison of incidence of adverse reactions

There was no significant difference in the incidence rate of nausea and vomiting, abdominal pain, diarrhea and hoarseness between the two groups (P>0.05). See Table 3.

Table 3.
Incidence of adverse reactions (n, %)

Group	Number of cases	Nausea and vomiting	Abdominal pain	Diarrhea	Hoarseness	Incidence (%)
Control group	50	5	3	3	1	12（24.0）
Study group	50	4	2	3	1	10（20.0）
X^2 value	/	1.563	1.571	1.612	1.563	6.539
P value	/	＞0.05	＞0.05	＞0.05	＞0.05	＞0.05

Comparison of FVC, FEV1 and PEF levels

Compared with the control group, the improvement of FVC, FEV_1 and PEF in the study group was relatively higher (P <0.05). See Table 4.

Table 4.
Indicators of FVC, FEV_1 and PEF ($\bar{x}\pm s$)

Group	Number of cases	FVC（L）		FEV_1（L）		PEF（L/s）	
		Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Control group	50	2.1±0.5	2.4±0.4	1.5±0.4	2.2±0.3	3.3±0.9	3.8±1.1
Study group	50	2.3±0.2	2.9±0.5	1.6±0.3	2.8±0.5	3.4±0.8	4.3±1.2
t value	/	1.653	16.218	1.056	16.365	1.659	16.218

P value	/	＞0.05	＜0.05	＞0.05	＜0.05	＞0.05	＜0.05

DISCUSSION

Mycoplasma pneumonia is a form of pediatric pneumonia with a high incidence in clinical practice, and its incidence has increased significantly in recent years, with the main season for this disease occurring in winter [6]. Mycoplasma is mainly transmitted through the human respiratory tract. When it invades the respiratory tract of the child, it will activate all the macrophages, lymphocytes, neutrophils, etc., leading to the large amount of secretion of various inflammatory factors, and further cause airway inflammation, resulting in serious local injury for the child. In recent years, mycoplasma pneumonia disease has become more and more serious, which will not only damage the lung tissues of children, but also seriously damage other organs outside the lungs. It is believed that mycoplasma pneumonia disease may be related to immune factors, but there is still no clear understanding of specific pathogenesis [7]. Ambiguous clinical signs but obvious pulmonary shadow on chest X-ray is one of the most typical features of mycoplasma pneumonia. However, because the clinical manifestation of the patient lacks certain specificity, it is impossible to make accurate judgment even through bacterial culture and blood routine, so it is difficult to effectively and reasonably treat the patient at the early stage of disease. The child patient often has other severe extrapulmonary symptoms during treatment. However, detection with mycoplasma antibodies has relatively high accuracy and sensitivity [8]. Therefore, if children have certain adverse symptoms such as respiratory tract infection, it is necessary to firstly consider whether they have mycoplasma infection, and timely make diagnosis through mycoplasma detection [9]. In the past, macrolide antibiotics were used clinically to treat children. Although they could further promote the improvement of clinical signs and symptoms, the overall therapeutic effect was not stable, and the probability of disease recurrence was high relatively.

Mycoplasma is one of the smallest types of pathogenic microorganisms that can survive on their own, with structures such as cell walls, so antibiotic drugs that inhibit cell wall synthesis are not therapeutically effective [10]. At present, many macrolide drugs which can effectively inhibit the synthesis of egg metamorphism are used to treat children, and their efficacy is relatively ideal [11]. In contrast, azithromycin intravenous infusion therapy belongs to one of the more commonly used clinical methods. Such drugs are a new type of macrolide antibacterial drugs, which greatly improve their pharmacological properties and can effectively inhibit molecular cyclization, thus further alleviating the gastrointestinal symptoms of children [12]. In addition, azithromycin has relatively strong tissue permeability, relatively high concentration in human lung and bronchus, and relatively long drug half-life, which can remove the pathogens in human body to the maximum extent. In addition, such drugs can effectively bind to the 50s subunit of bacterial nucleoprotein bodies in human body, thus inhibiting the process of bacterial transpeptidase, and further accelerating the synthesis of RNA protein and achieving the goal of effective control of infection [13]. It was found that, compared with the control group, the disappearance time of rales, the remission time of cough, the remission time of asthma and the time of hospitalization in the study group were relatively short ($P<0.05$), indicating that aerosol inhalation of budesonide suspension could play an ideal role, so as to significantly reduce the remission time of cough and the remission time of asthma and promote the improvement of the patient's disease condition and clinical symptoms. The reason for analysis is that budesonide suspension belongs to the type of glucocorticoid drugs with more clinical application and has relatively strong anti-inflammatory effect, but also belongs to the type of long-acting tricyclic antihistamines, which can competitively inhibit histamine H_1 receptor and thus resist peripheral H_1 to some extent. Moreover, it can further enhance the stability of lysosomal

membrane, smooth muscle cells and endothelial cells, effectively inhibit the immune reaction in the body, and effectively reduce the enzymatic reaction triggered by antigen-antibody binding, thus promoting the improvement of clinical signs and symptoms in children. However, through aerosol inhalation, the drug can play a direct role in the focus of the lung in children, and further inhibit the chemotaxis in the body and the synthesis and secretion of cell growth factor, so as to significantly reduce the airway hyperresponsiveness [14]. Not only can the dosage of the drug be significantly reduced without aggravating adverse reactions, but also can further promote the improvement of multiple clinical symptoms in children.

According to relevant studies, aerosol inhalation of glucocorticoids can change the microenvironment of cell membrane during clinical treatment, so that the function of calcium channel in the cell membrane of the patient can be significantly changed, resulting in further decrease of intracellular calcium ion concentration, and effective inhibition of inflammatory cell activation to a certain extent, thus greatly improving the airway inflammation symptoms of the patient [15]. The study found that, compared with the control group, the study group had relatively higher efficacy ($P<0.05$), and the study group had relatively higher improvement in FVC, FEV_1, PEF and other indicators ($P<0.05$). This indicated that aerosol inhalation of budesonide suspension could effectively enhance the therapeutic effect during clinical treatment, effectively promote the improvement of lung function and ensure the children's respiration returned to normal range as soon as possible. The results showed that budesonide could directly exert its effects on the lung lesions of children via aerosol inhalation, and could also inhibit the chemotaxis and the synthesis and secretion of cell growth factor, further increase the concentration of noradrenaline bound to α-adrenoceptors, and effectively inhibit the degranulation function of eosinophils and mast cells in the body. Thus, the airway hyperresponsiveness of the child patient was significantly reduced, and on the basis of signific antly reducing the side effects of the drug dose, the drug effect intensity was significantly enhanced, which was beneficial to further promote the improvement of the patient's disease condition and clinical symptoms.

In conclusion, aerosol inhalation of budesonide suspension in children with mycoplasma pneumoniae pneumonia can effectively enhance the therapeutic effect, promote the improvement of lung function, and reduce the disappearance time of rales and remission time of asthma, so it can be popularized.

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