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Analysis of the Clinical Effect of Pulmicort Respules Inhalation Combined with Cetirizine in the Treatment of Pediatric Asthma and its Influence on Inflammatory Factors in Children

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Abstract: *Objective:* To analyze the clinical value of Pulmicort Respules inhalation combined with cetirizine in the treatment of pediatric asthma. *Methods:* From December 2023 to December 2024, 82 children with asthma admitted to our hospital were randomly divided into a control group and an observation group, with 41 cases in each group. The clinical symptom relief time (shortness of breath, cough, dyspnea, lung wheezing), lung function indicators (FEV1, FVC, FEV1/FVC), inflammatory indicators (TNF-α, IL-6, IL-8), and clinical treatment effects were analyzed in the two groups. *Results:* The relief time for shortness of breath, cough, dyspnea, and lung wheezing in the observation group was shorter than that in the control group ($P < 0.05$). After treatment, compared with the control group, the levels of FEV1, FVC, FEV1/FVC, and treatment efficiency in the observation group were higher, while the levels of TNF-α, IL-6, and IL-8 were lower ($P < 0.05$). *Conclusion:* The combination of Pulmicort Respules inhalation and cetirizine oral therapy for children with asthma can shorten the improvement time of clinical symptoms, inhibit inflammation, and improve lung function.

Keywords: Pulmicort Respules; Cetirizine; Pediatric asthma; Inflammatory factors

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1. Introduction

Among pediatric diseases, asthma has become a common respiratory disorder. Recent studies have shown that with changes in people's lifestyles and the intensification of environmental pollution problems, the prevalence of childhood asthma is increasing annually [1]. The onset of this disease not only harms the physical development of young patients but also poses challenges to their mental health. The characteristic clinical manifestations of asthma typically involve periodic wheezing, accelerated breathing, chest discomfort, or persistent coughing, and diffuse wheezing sounds can be detected in the lungs of affected children. When timely treatment is not received after

the onset of symptoms, the condition may worsen, ultimately leading to complications such as lung infections or allergic rhinitis [2,3]. As a new generation of antihistamines, cetirizine can inhibit specific allergens through multiple pathways, demonstrating therapeutic value in respiratory diseases [4]. On the other hand, Pulmicort Respules is a drug that significantly suppresses respiratory inflammation. Studies have suggested its potential efficacy in treating childhood asthma, although its precise mechanism of action remains to be further investigated [5]. Currently, there is no scholarly research on the combined application of these two drugs in the treatment of pediatric asthma. Based on this, the present study selected asthmatic children to receive combination therapy and analyzed its clinical value.

2. Subjects and methods

2.1. Study subjects

From December 2023 to December 2024, 82 asthmatic children were selected from our hospital and randomly divided into a control group and an observation group, with 41 cases in each group. The control group consisted of 25 males and 16 females, with an average age of 6.8 ± 1.6 years. The observation group consisted of 26 males and 15 females, with an average age of 6.5 ± 1.8 years. The baseline data of the two groups were comparable ($P < 0.05$).

Inclusion criteria: All patients met the clinical diagnosis of pediatric asthma [6]; their bronchodilator test was positive, and their provocation test was also positive; both the children and their families signed informed consent forms.

Exclusion criteria: Children with neurological disorders who could not cooperate well with the treatment; children with autoimmune system diseases; children with severe allergic constitutions; children who had already received other treatment regimens before enrollment.

2.2. Methods

Treatment method for the control group: The patients were treated with Pulmicort Respules. Pulmicort Respules (2 mL) were mixed with normal saline (2 mL), and the oxygen flow rate for nebulization inhalation therapy was adjusted to 6–8 L, twice a day for 14 days.

Treatment method for the observation group: The patients in the observation group were treated with cetirizine tablets plus Pulmicort Respules. Pulmicort Respules (2 mL) were mixed with normal saline (2 mL), and the oxygen flow rate for nebulization inhalation therapy was adjusted to 6–8 L, twice a day for 14 days. Additionally, cetirizine tablets (manufacturer: UCB Farchim SA; specification: 10 tablets/box; approval number: registration number H20100739) were administered. Children aged 2–5 years received 2.5 mg per oral administration, children aged 6–10 years received 5 mg per oral administration, and children over 10 years old received 10 mg per oral administration, once a day for 14 days.

2.3. Indicator analysis

2.3.1. Clinical symptom relief time analysis

The clinical symptom relief time of the two groups of children, including shortness of breath, cough, dyspnea, and lung wheezing was analyzed.

2.3.2. Lung function indicators analysis

The lung function indicators of the two groups of children before and 3 days after treatment, including FEV1, FVC, and FEV1/FVC were analyzed.

2.3.3. Inflammation indicators analysis

The inflammation indicators of the two groups of children before and 3 days after treatment were analyzed,

including tumor necrosis factor-α (TNF-α), interleukin-6 (IL-6), and interleukin-8 (IL-8).

2.3.4. Treatment effect analysis

After treatment, if the children's clinical manifestations such as dyspnea and shortness of breath are significantly relieved, the frequency of attacks is significantly reduced, and no fine wet rales and wheezing sounds are detected in the lungs, it is considered markedly effective; if the clinical symptoms and frequency of attacks are improved after treatment, it is judged as effective; if the treatment results do not meet the above criteria, it is judged as ineffective. Except for ineffective cases, the rest are included in the effective range, and the overall effective rate is counted and compared between groups.

2.4. Statistical processing

Statistical software SPSS 26.0 was used for analysis. Measurement data is represented by mean ± standard deviation (SD), independent sample *t*-test was used for comparison between groups, paired *t*-test was used for comparison within groups, count data was expressed as a percentage, chi-square test was used for comparison between groups, and $P < 0.05$ was considered statistically significant.

3. Results

3.1. Analysis of clinical symptom relief time in two groups of children

The clinical symptom relief time of shortness of breath, cough, dyspnea, and lung wheezing in the observation group was shorter than that in the control group, with a difference ($P < 0.05$), as shown in **Table 1**.

Table 1. Analysis of clinical symptom relief time in two groups of children (mean ± SD)

Group	Shortness of breath	Cough	Dyspnea	Lung wheezing
Control group ($n = 41$)	4.26 ± 0.34	5.21 ± 1.03	3.67 ± 0.12	4.67 ± 0.67
Observation group ($n = 41$)	2.67 ± 0.19	2.43 ± 0.37	2.03 ± 0.11	2.66 ± 0.19
t-value	26.140	2.780	1.640	2.010
P-value	0.001	0.001	0.001	0.001

3.2. Analysis of lung function before and after treatment in two groups of children

There was no difference in lung function indicators before treatment between the two groups of children ($P > 0.05$). After treatment, the levels of FEV1, FVC, and FEV1/FVC were improved in both groups. Compared with the control group, the observation group had higher levels of FEV1, FVC, and FEV1/FVC, showing a significant difference ($P < 0.05$) as shown in **Table 2**.

Table 2. Analysis of lung function before and after treatment in two groups of children (mean ± SD)

Group	FEV_1 (L)		FVC (L)		FEV_1/FVC (%)	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Control group ($n = 41$)	1.12 ± 0.29	2.36 ± 0.51	1.29 ± 0.41	2.34 ± 0.37	52.16 ± 4.34	57.43 ± 4.91
Observation group ($n = 41$)	1.14 ± 0.25	3.71 ± 0.53	1.28 ± 0.43	3.99 ± 0.46	52.21 ± 4.30	62.86 ± 5.66
t-value	0.335	11.750	0.107	17.900	0.052	4.640
P-value	0.738	0.001	0.914	0.001	0.958	0.001

3.3. Analysis of inflammation indicators before and after treatment in two groups of children

There was no difference in inflammation indicators before treatment between the two groups of children ($P > 0.05$). After treatment, the levels of TNF-α, IL-6, and IL-8 decreased in both groups. Compared with the control group, the observation group had lower levels of TNF-α, IL-6, and IL-8, showing a significant difference ($P < 0.05$) as shown in **Table 3**.

Table 3. Analysis of inflammation indicators before and after treatment in two groups of children (mean ± SD)

Group	TNF-α (mg/ml)		IL-6 (ng/L)		IL-8 (ng/L)	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Control group ($n = 41$)	1151.34 ± 103.29	561.29 ± 30.37	80.67 ± 10.12	25.64 ± 2.19	60.37 ± 6.94	15.16 ± 5.34
Observation group ($n = 41$)	1150.67 ± 102.98	500.13 ± 19.64	80.60 ± 11.16	15.37 ± 1.06	60.35 ± 6.99	9.67 ± 1.02
t-value	0.029	10.830	0.029	27.030	0.013	6.466
P-value	0.976	0.001	0.976	0.001	0.989	0.001

3.4. Analysis of clinical treatment effects in two groups of children

Compared with the control group, the observation group had a higher effective treatment rate, showing a significant difference ($P < 0.05$) as shown in **Table 4.**

Table 4. Analysis of clinical treatment effects in two groups of children [*n* (%)]

Group	Effective treatment rate			
	Markedly effective	Effective	Ineffective	Total effective rate
Control group ($n = 41$)	13 (31.71)	22 (53.66)	6 (14.63)	35 (85.37)
Observation group ($n = 41$)	20 (48.78)	20 (48.78)	1 (2.44)	40 (97.56)
χ^2-value	-	-	-	6.115
P-value	-	-	-	0.013

4. Discussion

Through systematic clinical research, it has been found that there are numerous causes of cough in children, and the pathological mechanism of cough is relatively complex. Therefore, it is crucial to accurately diagnose the etiology of the patient during the disease treatment process. Asthma, as a disease with a complex etiology, poses certain difficulties in clinical treatment [7]. Common clinical manifestations of asthmatic children include wheezing sounds during breathing, repeated coughing, shortness of breath, and chest discomfort. Failure to provide timely and appropriate treatment not only harms the child's health status but may also negatively impact their physical development, thereby significantly reducing their quality of life. Parents need to avoid risk factors that trigger coughing in their daily lives, and once a child develops cough symptoms, they should seek prompt medical attention to prevent other complications and ensure the child's health and safety [8].

This study found that the combination of Pulmicort Respules nebulized inhalation and cetirizine oral therapy

for asthmatic children shortened the improvement time of clinical symptoms and significantly improved lung function. This suggests that combination therapy can effectively improve lung function and clinical symptoms in these patients. The reason for this may be that cetirizine can reduce the release of inflammatory mediators such as leukotrienes and cell adhesion molecules, lower the level of vasoactive peptides, and inhibit delayed-type hypersensitivity reactions from multiple angles [9]. Pulmicort Respules is a medication specifically designed to treat respiratory inflammation in children. Its excellent anti-inflammatory properties can rapidly alleviate symptoms in the acute phase of the disease, playing a crucial role in the treatment of pediatric asthma. Clinical studies have shown that many children have poor cooperation during treatment. To address this issue, nebulized inhalation therapy has been implemented, which not only significantly improves children's cooperation but also ensures that the medication directly targets the affected area [10]. This therapy improves the inflammatory condition within the bronchi, enhances drug acceptability, and markedly enhances the treatment effect.

Furthermore, this study also revealed that the combination of Pulmicort Respules nebulized inhalation and cetirizine oral therapy for asthmatic children resulted in significant improvement in inflammatory markers and clinical outcomes. This may be attributed to the fact that budesonide, after nebulization, forms tiny particles ranging from 2 to 5 micrometers in diameter. These particles, propelled by oxygen, directly target the diseased sites in the capillaries, effectively blocking the accumulation of inflammatory cells and reducing the release of inflammatory mediators, thereby exerting a remarkable anti-inflammatory effect [11]. Clinical research has found that Pulmicort Respules exhibit exceptionally strong binding affinity for glucocorticoid receptors. Coupled with its excellent solubility in water, it ensures high blood concentrations are maintained within the gel layer, thereby prolonging the duration of drug efficacy and enhancing the anti-inflammatory effect. Specifically, in the pediatric patient population, administering Pulmicort Respules via oxygen-driven nebulized inhalation allows the medication to form a "micro-reservoir" structure on the bronchial mucosa. Through this delivery method, the drug directly reaches the lungs of the child, resulting in effective deposition within the bronchi. This approach optimizes the maintenance of blood drug concentrations, greatly enhances clinical treatment efficacy, and directly inhibits the production and release of leukotrienes and arachidonic acid. This process alleviates airway resistance and facilitates improved lung function. Additionally, by optimizing the drug delivery pathway, the medication can directly target the lungs, reducing side effects during treatment and enhancing overall treatment efficacy. By adjusting the distribution of the drug within the airways, this technique further improves lung physiology, providing a more effective treatment option for pediatric patients [12,13].

5. Conclusion

In summary, the combination of Pulmicort Respules nebulized inhalation and cetirizine oral therapy for asthmatic children can effectively improve clinical symptoms, inhibit inflammatory markers, and ultimately enhance lung function in these patients.

Disclosure statement

The authors declare no conflict of interest.

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