

Evaluation on the Effects of Pulmicort Respules, Ventolin combined with Methylprednisolone in the Adjuvant Treatment of Bronchiolitis in Children

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Abstract: Objective: To investigate the effects of Pulmicort Respules, Ventolin combined with methylprednisolone in the adjuvant treatment of bronchiolitis in children. **Methods:** A total of 100 children with bronchiolitis in our hospital from March 2018 to March 2020 were selected and divided into 2 groups with 50 cases in each group by using random number table. Both groups received conventional treatment. Based on this, the control group was given Pulmicort Respules and Ventolin, and the observation group was given methylprednisolone in combination with the conventional regimens on the basis of the control group treatment, the course of treatment was 5 days. The levels of inflammatory factors [tumor necrosis factor- α (TNF- α), interleukin 6 (IL-6)] and the time to symptom disappearance before and after treatment were compared and analyzed between the two groups. **Results:** After treatment, the levels of serum TNF- α and IL-6 in the two groups decreased, and the observation group was lower than the control group, the difference was statistically significant ($P < 0.05$); the disappearance of pulmonary moist rales, lung wheezing, cough and wheezing in the observation group were all earlier than the control group, the difference was statistically significant ($P < 0.05$). **Conclusion:** Pulmicort Respules, Ventolin combined with methylprednisolone is effective in adjuvant treatment of bronchiolitis in children, which can reduce inflammation and promote the recovery of children.

Keywords: Pediatric bronchiolitis; Pulmicort Respules; Ventolin; Methylprednisolone; Inflammatory factors; Time to symptoms disappearance

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Bronchiolitis is a common acute lower respiratory tract infectious disease in children. It is mostly caused by viral or bacterial infections. The clinical manifestations are mainly asthma, cough, and wheezing^[1]. The prognosis of the disease is good, but when the condition is serious, it can induce respiratory failure or heart failure, threatening the life of children. Pulmicort Respules is a potent glucocorticoid, which can inhibit the inflammation of the respiratory tract and relieve bronchospasm; Ventolin is a selective β_2 adrenergic receptor agonist, which has good therapeutic effects on reversible airway obstruction diseases; methylprednisolone is a medium-acting glucocorticoid, which has strong anti-inflammatory and anti-allergic effects. In this study, Pulmicort Respules, Ventolin and methylprednisolone were used in combination in children with bronchiolitis to study their therapeutic effects. The report is as follows.

1.1 General Information

As approved by the Medical Ethics Committee of our hospital, 100 children with bronchiolitis who were treated in our hospital from March 2018 to March 2020 were selected and divided into 2 groups using a random number table. There were 50 cases in the control group, including 26 males and 24 females; the age range was 2 months to 1 year, with an average age of (0.71 \pm 0.24) years; the course of disease was 2-7 days, with an average of (3.98 \pm 1.17) days. There

were 50 cases in the observation group, including 23 males and 27 females; the age range was 3 months to 1 year, with an average age of (0.69±0.21) years; the course of disease was 2-7 days, with an average of (4.03±1.35) days. Comparing the general information of the two groups, the difference was not significant ($P>0.05$), therefore comparable.

1.2 Inclusion criteria

(1) Inclusion criteria: Meet the relevant diagnostic criteria^[2]; The children's family members voluntarily sign an informed consent form; All the patients were diagnosed by chest X-ray. (2) Exclusion criteria: Children with pneumonia, congenital heart disease, and tuberculosis infection; Children with heart failure and respiratory failure; Children allergic to the drugs in this study.

1.3 Methods

1.3.1 Conventional treatment

Both groups received conventional treatment: ① Oral compound sulfamethoxazole granules (Zhejiang Anbeite Pharmaceutical Co., Ltd., production batch numbers 20170901, 20190302, specifications: sulfamethoxazole 0.4g, trimethoprim 80mg), 1 bag/time for children under 40kg, 2 bags/time for children over 40kg, 2 times/d; ② Treat children with fever using ice pack, alcohol sponge bath and other therapies; ③ Oxygen therapy for children with severe wheezing and dyspnea.

1.3.2 The control group

Administer budesonide suspension for inhalation (trade name: Pulmicort, manufacturer: AstraZeneca Pty Ltd, production batch number: 20180202, 20190402, specification: 2ml: 0.5mg), salbutamol sulfate inhalation aerosol (Trade name: Ventolin, manufacturer: Shantou Medical Pharmaceutical Co., Ltd., production batch numbers: 20180103, 20190302, specification: 100ug/press), 1 mg Pulmicort Respules was added into 0.5ml of 5% Ventolin, diluted to 3ml by adding physiological saline, oxygen driven atomized inhalation, 1 time/8h,

the oxygen flow was controlled at 6-8L/min, the inhalation time was 10min/time, and the treatment course was 5d.

1.3.3 The observation group

Methylprednisolone sodium succinate for injection (trade name: methylprednisolone, manufacturer: PFIZER SA, production batch number: 20180201, 20190202, specification: 40 mg) was added on the basis of the control group treatment scheme, intravenous drip, 2 mg /kg, 1 time/12h, treatment course 5d.

1.4 Evaluation indicators

(1) Inflammatory factors: compare the levels of serum tumor necrosis factor- α (TNF- α) and interleukin 6 (IL-6) before and 5 days after treatment between the two groups. Collect 3mL of venous blood in the morning after fasting and separate the serum. Then it was tested with ZS-680 automatic biochemical analyzer (Zhongsheng (Suzhou) Medical Instrument Co., Ltd.). (2) Time to symptoms disappearance: Compare the disappearance time of cough, wheezing, pulmonary moist rales and lung wheezing between the two groups.

1.5 Statistical methods

The SPSS 25.0 software was used for data processing. The measurement data was expressed as and checked with t-test, and the count data was expressed as percentage and checked with χ^2 test. $P<0.05$ was considered statistically significant.

2 Results

2.1 Inflammatory factors

Before treatment, there was no significant difference in serum TNF- α and IL-6 levels between the two groups ($P>0.05$); after treatment, the levels of TNF- α and IL-6 decreased in both groups, and the observation group was lower than the control group, the difference is statistically significant ($P<0.05$). See Table 1.

Table 1. Comparison of the levels of inflammatory factors between the two groups before and after treatment ($\bar{x} \pm s$)

Time	Group	TNF- α (pg/ml)	IL-6 (ng/ml)
Before Treatment	Control (n=50)	39.48 \pm 5.32	3.04 \pm 1.06
	Observation (n=50)	39.36 \pm 5.47	2.95 \pm 1.03
	T	0.111	0.431
	P	0.912	0.668
After Treatment	Control (n=50)	33.52 \pm 4.18 ^a	2.41 \pm 0.77 ^a
	Observation (n=50)	24.19 \pm 3.65 ^a	1.24 \pm 0.49 ^a
	T	11.889	9.065
	P	0.000	0.000

Note: Compared to before treatment, ^a $P < 0.05$

2.2 The time to symptom disappearance

The disappearance time of cough, wheezing, pulmonary moist rales, and lung wheezing in the

observation group was earlier than that in the control group, and the difference is statistically significant ($P < 0.05$). See Table 2.

Table 2. Comparison of the time to clinical symptoms disappearance between the two groups ($\bar{x} \pm s, d$)

Group	Disappearance Time of Cough	Disappearance Time of Wheezing	Disappearance Time of Pulmonary Moist Rales	Disappearance Time of Lung Wheezing
Control (n=50)	7.21 \pm 1.28	3.43 \pm 0.64	7.01 \pm 2.30	5.67 \pm 1.63
Observation (n=50)	4.01 \pm 0.35	1.31 \pm 0.29	3.98 \pm 1.06	3.16 \pm 0.57
T	17.052	21.335	8.460	10.278
P	0.000	0.000	0.000	0.000

3 Discussion

The clinical symptoms of bronchiolitis are closer to those of pneumonia, but the main symptom is wheezing, which mostly occurs in children under one year old. Pulmicort Respules has strong anti-inflammatory effects and high glucocorticoid receptor binding ability, which can inhibit the activity of immune cells in the airway, reduce the secretion of inflammatory substances, and can repair the airway and reduce bronchial hyperresponsiveness^[3]. Ventolin can directly act on the airway smooth muscle surface to increase the level of intracellular cyclic adenosine monophosphate and inhibit the production of endogenous substances, thereby effectively dilating the bronchus and enhancing the clearance of fiber bronchial capillaries^[4]. However, it is worth noting that when Pulmicort Respules is used, it can easily cause adrenal cortex hypofunction, adrenal hyperfunction, and cause symptoms such as anorexia and allergies; Ventolin can easily induce hypokalemia, causing headaches and tachycardia in children, affecting the treatment effect.

This study showed that after treatment, the levels of serum TNF- α and IL-6 in the two groups decreased, and the observation group was lower in the levels than the control group; the observation group's symptoms of pulmonary moist rales, lung wheezing,

cough, and wheezing all disappeared earlier than the control group, it showed that Pulmicort Respules, Ventolin combined with methylprednisolone can reduce the level of inflammatory factors in children with bronchiolitis and promote their recovery. Analyzing the reasons: TNF- α is mainly produced by macrophages and monocytes, which can act on endothelial cells, damage blood vessels and trigger inflammation; IL-6 can stimulate and activate T cells and B cells, promote their proliferation, and at the same time accelerate the synthesis of acute-phase proteins in liver cells and participate in inflammation^[5]. Methylprednisolone is a medium-acting glucocorticoid, which can effectively reduce vascular congestion, inhibit the movement of inflammatory cells to the site of inflammation, and prevent a series of reactions with inflammatory mediators. At the same time, it can also regulate the function of phagocytes and stabilize the lysosomal membrane to exert anti-inflammatory effects. In addition, the drug can strengthen its anti-inflammatory activity through the methylation at the 6 α -position on its ring molecule, increase lung permeability, and thereby increase the blood drug concentration in the lungs, improve the therapeutic effects, and promote the recovery of children. As methylprednisolone has a weak affinity for albumin and transporter protein, and it mainly exists in the free form in the plasma,

the plasma concentration can quickly reach the peak value, which is beneficial to shorten the onset time of the drug and quickly relieve the symptoms in children^[6]. Combined with Pulmicort Respules and Ventolin, it can produce synergistic effects, effectively inhibit the secretion of inflammatory factors such as TNF- α , IL-6, and accelerate the treatment outcome in children.

In summary, Pulmicort Respules, Ventolin combined with methylprednisolone has distinct effects in the adjuvant treatment of bronchiolitis in children, which can control the inflammatory response and promote the recovery of children, therefore it is worthy of promotion.

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