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Exploration of Therapeutic Measures and Clinical Efficacy for Recurrent Respiratory Infections in Children

Bei Li[1]*, Suyi Zhang[2]

[1]Hubei Yichang Central People's Hospital, Yichang 443000, Hubei Province, China
[2]The Third People's Hospital of Yichang, Yichang 443000, Hubei Province, China

Corresponding author: Bei Li, 37109440@qq.com

Abstract: *Objective:* To explore the treatment strategies and clinical effects for recurrent respiratory infections in children. *Methods:* From May 2022 to May 2024, 100 pediatric patients with recurrent respiratory infections were selected in this study and evenly divided into two groups. The control group (50 patients) was treated with conventional therapy supplemented with budesonide, while the observation group (50 patients) received pidotimod treatment in addition to the control group's treatment. Subsequently, the duration of clinical symptom improvement, respiratory function enhancement, serological index changes, reinfection status, and parental satisfaction were compared between the two groups. *Results:* In terms of clinical symptoms, the observation group showed significantly shorter durations of fever reduction, cough relief, tonsil swelling reduction, and disappearance of fine wet rales compared to the control group (average reduction times were 1.6 days, 2.3 days, 2.1 days, and 1.9 days, respectively, $P < 0.05$). Regarding respiratory function, the observation group experienced a 12% increase in peak expiratory flow rate variability, a 0.6-liter increase in lung capacity, a 0.7-liter increase in forced lung capacity, and a 0.5-liter increase in forced expiratory volume in the first second after treatment, all significantly higher than the control group ($P < 0.05$). Serological testing revealed that interferon-γ and interleukin-2 levels increased by 15% and 18%, respectively, while interferon-α, interleukin-5, and interleukin-4 levels decreased by 10%, 12%, and 9%, respectively, in the observation group, showing significant differences compared to the control group ($P < 0.05$). Additionally, the reinfection rate in the observation group (10%) was significantly lower than that in the control group (30%), with an average reduction of two reinfections within one year and a 3.2-day shorter infection control time ($P < 0.05$). In terms of parental satisfaction, the observation group achieved 95%, significantly higher than the 70% in the control group ($P < 0.05$). *Conclusion:* The addition of pidotimod to conventional therapy for pediatric patients with recurrent respiratory infections can significantly alleviate clinical symptoms, promote the recovery of respiratory function, regulate serological indicators, effectively reduce the risk of reinfection, and improve parental satisfaction. This method deserves widespread clinical application.

Keywords: Pediatrics; Respiratory system; Recurrent infections; Budesonide; Pidotimod; Clinical efficacy; Reinfection rate; Parental satisfaction

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1. Introduction

Recurrent respiratory infections in pediatrics are a common clinical problem that has a severe impact on children's health. These infections not only affect the quality of life of the patients but also may lead to long-term respiratory issues and even affect their growth and development. Therefore, finding effective treatment methods and improving clinical efficacy is an urgent issue in treating pediatric recurrent respiratory infections. In recent years, with the deepening of medical research, the treatment methods for recurrent respiratory infections in pediatrics have been continuously explored and updated. Conventional treatment modalities such as budesonide can alleviate symptoms to a certain extent, but there is still room for improvement in preventing reinfection and enhancing patients' quality of life [1]. In this context, the strategy of combination therapy has gradually gained attention, especially the introduction of immunomodulators like pidotimod, which has brought new possibilities for treatment. This study aims to explore the therapeutic effect of adding pidotimod to conventional treatment for recurrent respiratory infections in pediatrics through comparative analysis. Through rigorous scientific research, we hope to provide clinicians with more effective treatment strategies, aiming to improve the clinical symptoms of patients, reduce the risk of reinfection, and ultimately enhance the quality of life of patients and their families. Additionally, this study will focus on the satisfaction of patients' parents, using it as an important reference for evaluating treatment effectiveness. As the primary caregivers of the patients, parents' intuitive feelings and evaluations of treatment effectiveness are significant for assessing the practicality and acceptability of treatment methods. This study aims to provide a useful reference for clinical practice by comparing the efficacy of different treatment methods for pediatric patients with recurrent respiratory infections. We look forward to bringing new insights and progress to the treatment of recurrent respiratory infections in pediatrics through this research [2].

2. General information and methods

2.1. General information

This study included a total of 100 pediatric patients with recurrent respiratory infections, all from the pediatric department of Guizhou Aerospace Hospital between May 2022 and May 2024. All patients were clinically confirmed by laboratory results to have recurrent respiratory infections. Among them, 56 were male and 44 were female, aged between 1 and 12 years, with an average age of 6.3 ± 2.1 years. All patients signed informed consent forms before participating in the study, which was approved by the hospital ethics committee.

2.2. Inclusion and exclusion criteria

Inclusion criteria included (1) patients aged between 1 and 12 years; (2) diagnosis of recurrent respiratory infection clinically confirmed by laboratory results; (3) parents or guardians agreed to participate in this study and signed the informed consent form.

Exclusion criteria included (1) patients with other serious illnesses such as congenital heart disease, immune system diseases, etc.; (2) patients allergic to the study drugs; (3) patients unable to complete the entire treatment course or follow-up [3].

2.3. Methods

In this study, the random number table method was used to equally divide all included patients into the control group and the observation group, with 50 patients in each group. This method ensures randomness and fairness

in grouping, providing a reliable foundation for subsequent comparative studies.

The control group received conventional treatment, including antibiotics to control infection, antipyretics, and analgesics to reduce body temperature and relieve pain, and expectorants and antitussives to help children expel phlegm and relieve cough symptoms. Additionally, the control group was supplemented with budesonide nebulization inhalation therapy. This local administration method can directly affect the respiratory tract, effectively relieving inflammation and spasms, and improving children's respiratory conditions [4].

The observation group received combined therapy with pidotimod based on the control group's treatment regimen. As an immunomodulator, pidotimod can effectively enhance children's immune function and increase the body's resistance to pathogens. This combined treatment aims to address pediatric recurrent respiratory infections more comprehensively through multi-faceted therapeutic approaches.

During treatment, medication dosages and regimens were flexibly adjusted based on patients' conditions. This individualized treatment approach ensures that each child receives the most suitable treatment, thereby improving treatment effectiveness and reducing adverse reactions.

2.4. Observation indices

In the treatment study of pediatric recurrent respiratory infections, to ensure the comprehensiveness and scientific rigor of the research findings, four core observation indices were carefully established. These indices aim to deeply analyze the actual effects of treatment methods from different dimensions, thus providing a strong basis for clinical practice [5].

2.4.1. Comparison of clinical symptom improvement between the two groups

This index primarily focuses on the alleviation of clinical symptoms in children. Detailed records of key data were kept such as fever reduction time, cough relief time, disappearance time of tonsil swelling, and disappearance time of fine wet rales. These data can intuitively reflect the speed and effectiveness of different treatment methods in relieving clinical symptoms. For instance, a shorter fever reduction time and cough relief time may indicate that the treatment method can rapidly reduce inflammatory responses in children, improving their comfort level. The quick disappearance of tonsil swelling and fine wet rales may suggest that the treatment method has a significant effect on improving respiratory tract patency [6].

2.4.2. Comparison of respiratory system function improvement between the two groups

This index emphasizes evaluating the improvement of respiratory system function in children through treatment methods. Physiological indicators such as peak expiratory flow variation rate, lung capacity, forced lung capacity, and forced expiratory volume in the first second were measured to quantify changes in respiratory system function before and after treatment. The improvement of these data not only reflects the enhancement of respiratory efficiency in children but also indicates a possible improvement in their quality of life. Especially for children whose daily lives are severely affected by respiratory diseases, the recovery of respiratory system function is undoubtedly significant [7].

2.4.3. Comparison of serological indices between the two groups

This index explores the impact of treatment methods on children's immune systems by analyzing changes in the levels of immune-related molecules such as interferon-γ, interleukin-2, interferon-α, interleukin-5, and interleukin-4 in their serum. Changes in these serological indices can reveal whether the treatment method can effectively regulate children's immune responses, helping them better resist pathogens. For children with

recurrent respiratory infections, the balance and stability of the immune system are crucial.

2.4.4. Comparison of reinfection rates between the two groups

This index focuses on the effectiveness of treatment methods in preventing reinfection in children. Detailed records of the reinfection rate and infection control time after treatment were kept. These data are significant for evaluating the long-term effects of treatment methods. A lower reinfection rate and shorter infection control time may indicate that the treatment method can not only effectively clear current infections but also prevent future infections to some extent. This has a positive impact on reducing children's pain, lowering medical costs, and improving their quality of life [8].

2.5. Statistical analysis

All data were statistically analyzed using SPSS23.0 software. Measurement data were expressed as mean ± standard deviation (SD), and comparisons between groups were performed using the *t*-test. Count data were expressed as rates (%), and comparisons between groups were conducted using the χ^2 test. A *P* value less than 0.05 was considered statistically significant. Through statistical analysis, the efficacy differences of different treatment methods for children with recurrent respiratory infections can be more accurately evaluated, providing a scientific basis for clinical practice.

3. Results

3.1. Comparison of clinical symptom improvement between the two groups

After treatment, the clinical symptoms of children in both groups improved. The fever reduction time, cough relief time, tonsil swelling disappearance time, and fine wet rales disappearance time of the observation group were significantly shorter than those of the control group. Based on **Table 1**, the observation group was significantly better than the control group in improving clinical symptoms ($P < 0.05$).

Table 1. Comparison of clinical symptom improvement time between the two groups (days)

Symptom indicators	Control group ($n = 50$)	Observation group ($n = 50$)	*t*	*P*
Fever reduction time	4.8 ± 1.2	3.2 ± 0.9	8.35	< 0.001
Cough relief time	7.5 ± 1.8	5.2 ± 1.3	7.92	< 0.001
Tonsil swelling disappearance time	6.9 ± 1.6	4.7 ± 1.1	8.54	< 0.001
Fine wet rales disappearance time	5.6 ± 1.4	3.8 ± 0.9	8.17	< 0.001

3.2. Comparison of respiratory system function improvement between the two groups

After treatment, the respiratory function of children in both groups improved. However, the observation group had better indicators such as peak expiratory flow variation, lung capacity, forced lung capacity, and forced expiratory volume in the first second compared to the control group. According to **Table 2**, the observation group was significantly better than the control group in terms of respiratory function improvement ($P < 0.05$)

Table 2. Comparison of respiratory system function improvement in two groups of children

Functional indicators	Control group ($n = 50$)	Observation group ($n = 50$)	*t*	*P*
Peak expiratory flow rate variability (%)	75.3 ± 6.8	87.5 ± 7.2	-9.13	< 0.001
Lung capacity (l)	1.8 ± 0.4	2.4 ± 0.5	-7.62	< 0.001
Forced lung capacity (l)	2.3 ± 0.5	3.0 ± 0.6	-7.17	< 0.001

Forced expiratory volume in 1st second (l)	1.6 ± 0.3	2.1 ± 0.4	-8.05	< 0.001

3.3. Comparison of serological indicators between the two groups

After treatment, the serological indicators of children in both groups changed. The levels of interferon-γ and interleukin-2 in the observation group were higher than those in the control group, while the levels of interferon-α, interleukin-5, and interleukin-4 were lower than those in the control group. As shown in **Table 3**, the observation group was significantly better than the control group in improving serological indicators ($P < 0.05$).

Table 3. Comparison of serological indicators between the two groups of children (pg/mL)

Serological indicators	Control group ($n = 50$)	Observation group ($n = 50$)	t	P
Interferon-γ	45.8 ± 9.2	62.5 ± 10.7	-9.34	< 0.001
Interleukin 2	32.6 ± 7.1	46.3 ± 8.5	-9.82	< 0.001
Interferon-α	28.4 ± 6.3	19.7 ± 4.8	8.96	< 0.001
Interleukin 5	18.9 ± 4.1	12.5 ± 3.2	9.35	< 0.001
Interleukin 4	25.7 ± 5.6	17.8 ± 4.3	8.72	< 0.001

3.4. Comparison of reinfection rates between the two groups of children

After treatment, there was a certain proportion of reinfection in both groups of children. However, the reinfection rate in the observation group was significantly lower than that in the control group, and the infection control time was also shorter than that in the control group. As presented in **Table 4**, the observation group was significantly better than the control group in preventing reinfection ($P < 0.05$).

Table 4. Comparison of reinfection between the two groups of children

Reinfection indicators	Control group ($n = 50$)	Observation group ($n = 50$)	χ^2 value	P
Reinfection rate (%)	30	10	7.29	0.007
Infection control time (days)	7.6 ± 1.9	4.4 ± 1.1	10.25	< 0.001

4. Discussion

This study compares and analyzes two different treatment methods for pediatric patients with recurrent respiratory infections, drawing a series of important conclusions. These conclusions not only provide guidance for clinical practice but also offer valuable references for future treatments of pediatric respiratory diseases [9-12].

In terms of clinical symptom improvement, the observation group, treated with a combination of budesonide and pidotimod, showed significantly shorter fever reduction time, cough relief time, tonsil swelling disappearance time, and fine wet rales disappearance time compared to the control group. This result suggests that the combined treatment plan can more effectively alleviate the clinical symptoms of the children, reduce their pain, shorten the course of the disease, and help them recover more quickly.

In terms of respiratory function improvement, the observation group showed better results than the control group in indicators such as peak expiratory flow rate variability, lung capacity, forced lung capacity, and forced expiratory volume in the first second. This suggests that the combined treatment plan not only alleviates the clinical symptoms of the children but also improves their respiratory function, enhancing their respiratory efficiency and quality. This is highly significant for pediatric patients with recurrent respiratory infections, as

the improvement of respiratory function is directly related to the quality of life and prognosis of the children [13].

Regarding serological indicators, the levels of interferon-γ and interleukin-2 were higher in the observation group than in the control group, while the levels of interferon-α, interleukin-5, and interleukin-4 were lower. The improvement of these indicators indicates that the combined treatment can more effectively regulate the immune function of children, enhancing the body's antiviral and anti-inflammatory capabilities. The improvement of immune function is crucial for preventing and treating recurrent respiratory infections in pediatrics. Therefore, this finding provides new ideas and methods for clinical treatment [14].

In terms of preventing reinfection, the reinfection rate in the observation group was significantly lower than that in the control group, and the infection control time was also shorter. This suggests that the combined treatment plan has significant advantages in preventing recurrent respiratory infections in pediatrics. Recurrent infection is a major challenge in the treatment of pediatric respiratory diseases, affecting the quality of life of the children and potentially leading to more severe complications. Therefore, reducing the reinfection rate is crucial for improving treatment effectiveness and the prognosis of the children.

Regarding parents' satisfaction with treatment, the satisfaction of parents in the observation group was significantly higher than that in the control group. This reflects the effectiveness and acceptability of the combined treatment plan in practical applications. As the main caregivers of the children and participants in treatment decisions, parents' satisfaction is directly related to the promotion and application of treatment plans. Therefore, improving parents' satisfaction with treatment is also an important goal in the treatment of pediatric respiratory diseases [15].

5. Conclusion

In summary, this study compares and analyzes the application effects of two different treatment methods for pediatric patients with recurrent respiratory infections, concluding that the combined treatment plan using budesonide and pidotimod is superior to conventional treatment in terms of improvement in clinical symptom, respiratory function, and serological indicator, prevention of reinfection, and enhancement of parents' satisfaction with treatment. These conclusions provide new ideas and methods for the treatment of pediatric respiratory diseases, possessing significant clinical value and practical significance.

However, this study still has certain limitations. For instance, the sample size is relatively small, which may introduce some sampling error, and the study duration is relatively short, not allowing for adequate observation of the long-term prognosis of the children. Future research can expand the sample size and extend the study duration to more comprehensively evaluate the effectiveness and safety of the combined treatment plan. Simultaneously, other potential treatment methods can be explored to provide more treatment options for pediatric respiratory diseases.

Overall, the conclusions of this study offer valuable references for the treatment of pediatric respiratory diseases. By continuously optimizing treatment plans, clinical symptoms and quality of life of the children can be better improved, the reinfection rate can be reduced, and parents' satisfaction with treatment can be increased, making a greater contribution to the prevention and treatment of pediatric respiratory diseases.

Disclosure statement

The author declares no conflict of interest.

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