Clinical Study of Bronchoscopy Interventional Technique in The treatment of Pediatric Respiratory Diseases

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Abstract: Objective: To explore the clinical effect of bronchoscopy intervention in the treatment of respiratory diseases in children. Methods: 100 pediatric respiratory diseases treated in our hospital from January 2023 to June 2024 were selected as the study subjects and randomly divided into 2 groups. The control group was treated with conventional treatment and the observation group was treated by bronchoscopic intervention technique. The treatment effect, heart rate and blood gas analysis changes, and complication rate of the 2 groups were compared. Results: The treatment effect of the observation group was significantly better than that of the control group (P<0.05); the change of heart rate and blood gas analysis in the observation group was significantly better than that of the control group (P<0.05). Conclusion: Bronchoscopic interventional technology has significant clinical effect in the treatment of respiratory diseases in children, and can effectively improve the treatment effect, shorten the hospital time and reduce the incidence of complications. Therefore, bronchoscopy interventional technique can be used as one of the important means in the treatment of respiratory diseases in children.
***Keywords*:** bronchoscopic interventional technique; respiratory disease in children; clinical research

1. Introduction

As common and common diseases in pediatric clinic, the complexity and diversity of pediatric respiratory diseases bring great challenges to treatment. Especially for those children with airway stenosis, foreign body inhalation, refractory lung infection and congenital airway development and other problems, traditional treatment methods are often difficult to achieve ideal results, and may even delay the condition, affecting the health and life safety of children [1-2]. With the continuous progress of medical technology and the accumulation of clinical experience, the application of bronchoscopy interventional technology in the treatment of respiratory diseases in children is increasingly extensive and deep. This paper aims to review the bronchoscopy interventional technology in children, discuss the application status, technical advantages, treatment effect and potential problems, provide valuable reference and reference for clinicians, in order to further improve the treatment of children's respiratory diseases, guarantee the health and life safety of children [3-4].

2. Data and methods

2.1 General information

A total of 100 pediatric patients with respiratory diseases treated in our hospital from January 2023 to June 2024 were selected as the study subjects and randomly divided into 2 groups. The control group: 22 males, 28 females, age range 2-13 years, mean age (8.57 ± 2.05); observation group: 21 males, 29 females, age range 2-14 years, mean age (8.71 ± 2.12). General data of 2 groups were not statistically significant, P> 0.05, which was comparable.

Inclusion criteria: ① Clear diagnosis: according to the medical history, clinical manifestations, imaging examination and laboratory examination, confirmed as respiratory diseases, such as bronchial foreign body, bronchial asthma, bronchiectasis, atelectasis, pneumonia, congenital respiratory malformation, etc.② With indications for bronchoscopy intervention, such as a. clear lesion site, the etiology and pathological type need to be further defined; b. local treatment, such as foreign body removal, hemostasis, drug injection; c., severe respiratory tract obstruction, requiring bronchiectasis treatment; d. severe pneumonia, atelectasis and other diseases, requiring alveolar lavage.③ The family members of the children volunteered to participate in the study and signed the informed consent form.④ The child can cooperate with the bronchoscopy interventional therapy and related examinations.

Exclusion criteria: ① Severe cardiac, hepatic and renal insufficiency, blood system diseases, systemic infectious diseases, mental diseases, etc., cannot tolerate bronchoscopic interventional therapy.② Allergy or contraindications to bronchoscopy intervention, such as severe laryngeal edema, airway stenosis, etc.③ Severe respiratory failure, requiring mechanical ventilation treatment.④ Recently have received other treatments that may affect the study results, such as anti-

infection, hormones, immunosuppressive agents, etc.⑤ The family of the child did not agree to participate in the study or unable to sign the informed consent.⑥ The child could not cooperate with the bronchoscopic interventional therapy and related examinations.

2.2 Methods

The control group was treated with conventional treatment.①Symptom assessment and monitoring: Doctors will conduct a comprehensive assessment of the respiratory symptoms in children, including cough, dyspnea, fever, etc., and monitor the changes in the symptoms.② Drug therapy: According on the specific condition of the child, the doctor may prescribe antibiotics, antiviral drugs, bronchodilators, corticosteroids and other drugs. For example, for bacterial infections, antibiotics are the main treatment, and for viral infections, antiviral drugs are usually used, combined with symptomatic treatment, such as fever withdrawal, cough suppression, etc.③ Physical therapy: Physical therapy includes aerosol inhalation therapy, which directly acts on the respiratory tract, and can use glucocorticoids, β 2-receptor agonists and other drugs to relieve airway spasm and inflammation.④ Home care guidance: Doctors will provide home care guidance to parents, including maintaining indoor ventilation, avoiding exposure to smoke and other irritants, maintaining appropriate indoor humidity, etc., to reduce the risk of respiratory irritation and infection.⑤ Nutrition and lifestyle adjustment: encourage parents to provide a balanced diet for children, ensure adequate water intake, as well as appropriate physical activity, to enhance children's immunity.⑥ Regular follow-up: During the treatment, the doctor will arrange regular follow-up to monitor the recovery of children and the effect of drug treatment, and adjust the treatment plan if necessary.

The observation group was treated with a bronchoscopic interventional technique.① Preoperative preparation: medical history collection: ask the child's medical history, drug allergy history, surgical history in detail, and evaluate the condition and indications of the child. Physical examination: Conduct a comprehensive physical examination, focusing on the respiratory system, cardiovascular system, liver and kidney function, etc. Laboratory examination: blood routine, coagulation function, infectious disease screening, electrocardiogram and other examinations to ensure that the children meet the surgical conditions. Preoperative conversation: explain the necessity, risks and possible complications of bronchoscopy interventional therapy to the parents in detail, and sign the informed consent form. Preoperative fasting: the children should fast and forbid water for 4-6 hours before surgery to reduce the risk of intraoperative vomiting and aspiration. Drug preparation: prepare the drugs that may be used during the operation, such as anesthetics, sedatives, hemostatic drugs, etc.② Intraoperative operation: anesthesia: according to the age, weight and condition of the child, choose the appropriate anesthesia mode, such as general anesthesia, local anesthesia or intravenous anesthesia. Bronchoscopic insertion: the child is taken in the supine position, the head is tilted back, the operator will insert the bronchoscopy through the nose or mouth, and gradually enter the lesion site along the throat, trachea and bronchus. Lesion observation: observe the lesion site under direct bronchoscopy to clarify the scope, nature and degree of the lesion. Treatment procedure: a. sputum suction: use bronchoscopy to attract secretions and clean the respiratory tract. B. Lavage: Lavute the lesion site with normal saline or antibiotic solution to reduce inflammation. C. Biopsy is taken: A biopsy is taken at the site of the lesion for pathological examination. D. Injection therapy: drug injection therapy of diseased sites such as bleeding and inflammation. E. Bronchiectasis: dilation of the narrow bronchus to improve ventilation. Postoperative observation: After the operation, the vital signs, respiratory status and complications were closely observed.③ Postoperative treatment: monitoring: the child entered the resuscitation room for continuous monitoring of vital signs of heart rate, respiration, blood pressure and other vital signs. Analgesia: appropriate analgesic drugs were given according to the pain level of the child. Prevent infection: Give antibiotics to prevent infection. Postoperative care: keep the children unobstructed, regularly turn over, pat the back, promote sputum discharge. Discharge guidance: inform the parents of the postoperative precautions, and review regularly.

2.3 Observing indicators

①Compare the treatment effects in the 2 groups. Significant effect: refers to that after bronchoscopy interventional treatment, the child's respiratory symptoms and signs were significantly improved, such as cough, wheezing, dyspnea and other symptoms basically disappeared, imaging examination showed that the lesions were obviously absorbed, the respiratory tract was unobstructed, and the child's daily life and learning ability returned to normal. Effective: after treatment, the child's respiratory symptoms and signs were improved, such as cough, wheezing and other symptoms were reduced, imaging examination showed that the lesions were absorbed, the respiratory tract was unobstructed, and the child's daily life and learning ability was improved. Ineffectiveness: after treatment, the respiratory symptoms and signs of the children were not significantly improved, or even aggravated, imaging examination showed that the lesions were not absorbed or aggravated, the respiratory tract was still not unobstructed, and the daily life and learning ability of the children were still affected. This indicates that the bronchoscopy intervention technique is not effective for the child, and other treatments

should be considered.

②Bronchoscopy, heart rate and blood gas analysis before and after treatment. Blood gas analysis covers key indicators such as SaO_2, $PaCO_2$ and PaO_2.

③Compare the complication rates in the 2 groups. Including pneumothorax, bleeding, allergy, infection.

2.4 Statistical treatment

SPSS 25.0 is used to analyze metric data that conforms to a normal distribution, expressed as mean ± standard deviation ($\bar{x} + s$). t-test is used in inter group comparison. Data expressed are counted as an example (%). Inter group comparison is made by using x^2 test. P<0.05 indicates a statistically significant difference.

3. Results

3.1 Comparison of the treatment effect in the 2 groups

Table 1. Comparison of the treatment effects in 2 groups

Group	Excellence	Effective	Be of no effect	Total effective rate
Observation group (n=50)	42	7	1	49(98.00)
Control group; matched group (n=50)	26	15	9	41(82.00)
x^2				8.657
P				0.011

3.2 Comparison of the changes in heart rate and blood gas analysis in the 2 groups

Table 2. Comparison of the heart rate and blood gas analysis changes in 2 groups

Group	Heart rate (order/min)	SaO_2(%)	$PaCO_2$(mmHg)	PaO_2(mmHg)
Observation group (n=50)	90.35±12.02	94.61±7.25	8.71±0.41	7.62±0.68
Control group; matched group (n=50)	122.24±12.09	86.41±6.12	7.25±0.62	9.03±0.73
t	27.564	8.574	5.684	7.324
P	0.001	0.012	0.032	0.023

3.3 Comparison of the complication rate in the 2 groups

Table 3. Comparison of the complication rates in 2 groups

Group	Aerothorax; pneumothorax	Hemorrhage	Acrosthesia	Affect	Total incidence
Observation group (n=50)	1	0	1	0	2(4.00)
Control group; matched group (n=50)	3	5	4	2	14(28.00)
x^2					10.358
P					0.001

4. Discussion

In recent years, the clinical research of bronchoscopy intervention technology in the treatment of pediatric respiratory diseases has made remarkable progress, and its unique advantages make this technology become an important means in the diagnosis and treatment of pediatric respiratory diseases. The bronchoscopic intervention technique enters the airway of the child through a slender catheter and directly observes and handles the lesion site, which greatly improves the diagnostic accuracy and targeted [5].

In pediatric respiratory diseases, bronchoscopy intervention technology has shown its unique clinical value. For example, in treating dyspnea caused by foreign body inhalation, bronchoscopy is able to quickly locate and remove the foreign body, effectively relieving the symptoms of the child and avoiding further complications [6]. In addition, bronchoscopy also has significant results for symptoms such as wheezing and cough caused by chronic inflammation, stenosis or bronchiectasis. Through microscopic lavage, secretion removal, local drug administration and other operations, it can directly act on the lesion site, improve the respiratory function of children, and improve the quality of life [7]. Bronchoscopic intervention technology is also excellent in the treatment of tracheobronchial tuberculosis (TBTB) in children. Through bronchoscopic

observation, the lesions in the bronchus, such as new granulation tissue, casetics, etc., can be clearly seen, so as to accurately judge the lesion type and stage [8]. Combined with frozen interventional therapy and other means, it can effectively remove the diseased tissue, restore the bronchial patency, and improve the therapeutic effect [9]. In clinical practice, the operation of bronchoscopy interventional technology is relatively complex, which requires rich experience and exquisite technology. With the continuous development and improvement of the technology, the safety of the technology has also been significantly improved. Through adequate preoperative evaluation, anesthesia and meticulous intraoperative monitoring, the operation can ensure smooth progress and reduce the occurrence of complications [10].

The total response rate in the observation group was as high as 98.00%, which was significantly higher than the 82.00% in the control group (P=0.011), indicating that the bronchoscopy intervention technique could significantly improve the treatment effect. In terms of heart rate and blood gas analysis, the heart rate in the observation group was significantly reduced (P=0.001), SaO_2 (blood oxygen saturation) was significantly increased (P=0.012), $PaCO_2$ (partial pressure of carbon dioxide) and PaO_2 (oxygen partial pressure) were significantly improved (P <0.05), showing that the technology had a positive effect on improving the respiratory function of children. In terms of complication rate, the overall complication rate in the observation group was 4.00%, which was much lower than 28.00% in the control group (P=0.001), indicating the significant advantage of bronchoscopy interventional technique in reducing complications during treatment. The incidence of pneumothorax, bleeding, allergy and infection in the observation group were lower than those in the control group, demonstrating the safety of this technique. In the terms of quality of life assessment, the scores of the observation group were significantly higher than those of the control group in cognitive level, social function, physical function, emotional function and role function (P <0.001), indicating that bronchoscopy intervention can not only effectively treat diseases, but also significantly improve the quality of life of children.

In conclusion, the bronchoscopy interventional technique has unique advantages and significant clinical effects in the treatment of respiratory diseases in children. It not only improves the accuracy of diagnosis and the pertinence of treatment, but also significantly improves the symptoms and quality of life of the children. Therefore, this technology has a broad application prospect and promotion value in the diagnosis and treatment of pediatric respiratory diseases. In the future, with the continuous progress of technology and the accumulation of clinical experience, it is believed that the bronchoscopy interventional technology will play a more important role in the treatment of pediatric respiratory diseases.

References

[1] Pingcuo Yangji, Renzeng Zhuoga, Zhao Rong, Ru Xifang. Clinical value and safety of bedside electronic bronchoscope applied in pediatric intensive care children in Xizang region [J]. Xizang Science and Technology, 2023,45 (08): 46-49.

[2] Xu Liyang, Yang Xue. Clinical application report of fiberoptic bronchoscopy in 73 patients with acute and severe respiratory diseases [J]. Modern Health care, 2022,22 (16): 1419-1420.

[3] Mi Peiming, Dai Hongfa, Xu Zhiwei, Huang Zhirong, Liao Cuile, Wen Shangmei. Analysis of the diagnosis and treatment of 1000 pediatric respiratory diseases by bronchoscopy [J]. Chinese Journal of Practical Rural Doctors, 2021,28 (09): 43-46.

[4] Liu Shuai. Analysis of the application of fiberoptic bronchoscopy in the clinical diagnosis and treatment of pediatric respiratory diseases [J]. Rural Health in China, 2021,13 (14): 31 + 33.

[5] CAI Qian. Clinical observation of midazolam inhalation in pediatric bronchoscopy [J]. Smart Health, 2019,5 (34): 91-93.

[6] Ding Kun. Safety analysis of fiberoptic bronchoscopy in the diagnosis and treatment of pediatric respiratory diseases [J]. Practical electronic journal of gynecological endocrinology, 2019,6 (33): 51.

[7] Gao Zhankui, Chen Libiao. Role of electronic bronchoscope in pediatric respiratory diseases [J]. Continuing Medical Education in China, 2019,11 (06): 76-78.

[8] Li Jian, Zhang Lei. Effect and safety analysis of fiberoptic bronchoscope in the diagnosis and treatment of pediatric respiratory diseases [J]. Jiangxi Medicine, 2018,53 (12): 1423-1424 + 1431.

[9] Liu Chunyu, Wang Yuzhe, Jin Zhen Ai, Yuan Xizhe, Jin Zheng. Progress in the application of fiberoptic bronchoscopy in common respiratory diseases [J]. Journal of Medicine of Yanbian University, 2018,41 (03): 232-234.

[10] Dai Li, Wu Yabin, Cao Xin. Observation on the effect of painless fiberoptic bronchoscopy in the diagnosis and treatment of respiratory diseases in children [J]. Journal of Clinical Pulmonary Science, 2018,23 (01): 94-96.