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Evaluation of Nursing Effect and Satisfaction in the Treatment of Pediatric Bronchial Pneumonia with Mechanical Expectoration Drainage Combined with Traditional Chinese Medicine Acupoint Application

Bei Chen, Na Li*

Department of Pediatrics, Taixing People's Hospital, Taixing 225400, Jiangsu, China

**Author to whom correspondence should be addressed.*

Abstract: *Objective*: To evaluate the nursing value of mechanical expectoration drainage combined with traditional Chinese medicine acupoint application in children with pediatric bronchial pneumonia. *Methods*: A total of 62 children with pediatric bronchial pneumonia treated from May 2024 to May 2025 were selected as samples and randomly divided into groups using a random number table. Group A received mechanical expectoration drainage combined with traditional Chinese medicine acupoint application nursing, while Group B received conventional nursing. Lung function, symptom disappearance time, nursing satisfaction, and inflammatory indicators were compared between the two groups. *Results*: The maximum vital capacity (FVC), forced expiratory volume in one second (FEV), peak expiratory flow (PEF), and maximal mid-expiratory flow (MMEF) in Group A were all higher than those in Group B, with $p < 0.05$; the symptom disappearance time in Group A was shorter than that in Group B, and nursing satisfaction was higher in Group A than in Group B, with $p < 0.05$; the procalcitonin (PCT), white blood cell count (WBC), and serum amyloid A (SAA) levels in Group A were lower than those in Group B, with $p < 0.05$. *Conclusion*: The application of mechanical expectoration drainage combined with traditional Chinese medicine acupoint application nursing in the care of children with pediatric bronchial pneumonia reduces inflammation levels, shortens symptom disappearance time, and improves lung function.

Keywords: Pediatric bronchial pneumonia; Mechanical expectoration drainage; Traditional Chinese medicine acupoint application; Satisfaction

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1. Introduction

Pediatric bronchopneumonia is a common respiratory disease that is associated with respiratory system lesions triggered by viruses, bacteria, and mycoplasma invading the respiratory tract. It can lead to secondary inflammatory responses in organs, exacerbate organ damage, and even endanger the lives of affected children. Common symptoms of pediatric bronchopneumonia include wheezing, coughing up sputum, fever, etc., necessitating timely expectorant, cough-relieving, and anti-infective treatments [1]. However, due to the immature development of the airways in children, affected children are unable to expel thick mucus on their own, which can worsen pulmonary dysfunction and even obstruct the respiratory tract, exacerbating dyspnea. Therefore, mechanical vibration sputum evacuation devices should be used to assist in sputum evacuation. On this basis, combined with traditional Chinese medicine acupoint application therapy, which stimulates specific acupoints based on the theory of traditional Chinese medicine meridians, it can enhance the pharmacological effects on tissues and organs with high medication safety [2]. This paper explores the nursing value of mechanical sputum evacuation combined with traditional Chinese medicine acupoint application by taking 62 cases of children with pediatric bronchopneumonia who sought medical treatment from May 2024 to May 2025 as samples.

2. Materials and methods

2.1. Materials

Sixty-two children with pediatric bronchopneumonia who sought medical treatment from May 2024 to May 2025 were selected as samples and randomly divided into groups using a random number table. The data of children with pediatric bronchopneumonia in Group A were compared with those in Group B, with $p < 0.05$, as shown in **Table 1**.

Table 1. Data analysis table for children with pediatric bronchopneumonia

Group	n	Gender (%)		Age (years)		Disease duration (d)	
		Male	Female	Interval	Mean	Interval	Mean
Group A	31	16 (51.61)	15 (48.39)	0.5–12	6.11 ± 0.87	2–7	4.09 ± 0.71
Group B	31	17 (54.84)	14 (45.16)	1–12	6.09 ± 0.91	2–8	4.11 ± 0.68
χ^2/t	-	0.0648		0.0884		0.1133	
p	-	0.7991		0.9298		0.9102	

2.2. Inclusion and exclusion criteria

2.2.1. Inclusion criteria

(1) Conformity to the criteria for bronchopneumonia outlined in "Zhu Futang's Practical Pediatrics" [3]

(2) Parental signed informed consent

(3) Presence of symptoms such as cough, expectoration, fever, etc., along with imaging findings indicative of shadows

2.2.2. Exclusion criteria

(1) Administration of antibiotics prior to enrollment

(2) Concomitant severe respiratory diseases

(3) Age exceeding 14 years

2.3. Treatment methods

2.3.1. Group A

(1) Mechanical sputum drainage

Prior to sputum drainage, evaluate the pediatric patient to determine the indications for mechanical sputum drainage, and record data such as weight, respiratory status, medication allergies, and underlying diseases. Based on the severity of the pediatric patient's condition, select an appropriate mechanical sputum drainage device to perform vibratory sputum drainage therapy. Adjust the treatment parameters according to the patient's age, body mass, and condition, initially setting the suction frequency to 20 Hz for a duration of 5 minutes, while simultaneously percussing the patient's back to facilitate sputum expulsion. It is recommended to perform vibratory sputum drainage 2–3 times a day, preferably before meals or 2 hours after meals. Prior to vibratory sputum drainage, assist the pediatric patient in maintaining a semi-reclined or upright position, loosen their collar, ensure adequate oral hydration before suctioning, and pay attention to mastering the correct operational techniques during suctioning to avoid causing harm to the patient.

(2) Traditional Chinese medicine acupoint application, with the following formula

30 g each of asarum and ginger; 15 g each of *Fructus aurantii* and astragalus; 20 g each of mint, platycodon, and perilla leaf. The aforementioned herbs are ground into powder. An appropriate amount of the powder is taken and mixed evenly with vinegar, then evenly applied to the Tiantu acupoint, Feishu acupoint, and Shanzhong acupoint. The medication is fixed with transparent adhesive tape. Each application lasts for 30–60 minutes, 1–2 times per day. Continuous application lasts for 3–7 days.

2.3.2. Group B received routine care

Massage the child's chest to accelerate the discharge of respiratory secretions. Administer antitussive and antipyretic drugs to alleviate symptoms such as fever, cough, and expectoration in the child. Meanwhile, ensure proper nutrition and dietary management to expedite the child's recovery.

2.4. Observation indicators

2.4.1. Pulmonary function indicators

Pulmonary function testers were used to monitor indicators such as FVC, FEV, PEF, and MMEF in the children.

Time of symptom disappearance and nursing satisfaction: Record the time for the child's body temperature to return to normal, the time for lung sounds to disappear, and the time for cough to subside; evaluate using our self-made pediatric bronchial pneumonia nursing satisfaction scale, with scores of 30–100 indicating satisfaction and scores < 30 indicating dissatisfaction.

2.4.2. Inflammatory indicators

Collect 5 mL of venous blood from the child, centrifuge (for 10 minutes at a speed of 3500 r/min) to obtain serum, and detect PCT and SAA using the enzyme-linked immunosorbent assay method; detect WBC using a blood cell analyzer.

2.5. Statistical study

Data were processed using SPSS 23.0, with the chi-square test used for count data and recorded as percentages, and the *t*-test used for measurement data and recorded as mean ± standard deviation ($\overline{x}$ ± s). Statistical differences were considered significant at $p < 0.05$.

3. Results

3.1. Pulmonary function indicators

After nursing, the FEV1, MMEF, FVC, and PEF in Group A were all higher than those in Group B, with $p < 0.05$. See **Table 2**.

Table 2. Analysis of pulmonary function indicators ($\overline{x}$ ± s)

Group	FEV1 (L)		MMEF (L/S)		FVC (L)		PEF (L/S)	
	Before	After	Before	After	Before	After	Before	After
Group A (n = 31)	2.05 ± 0.18	2.74 ± 0.26	0.89 ± 0.35	1.68 ± 0.51	1.59 ± 0.32	2.56 ± 0.49	2.79 ± 0.42	4.43 ± 0.59
Group B (n = 31)	2.07 ± 0.21	2.49 ± 0.24	0.91 ± 0.33	1.41 ± 0.43	1.58 ± 0.36	2.12 ± 0.41	2.81 ± 0.46	4.02 ± 0.51
t	0.4026	3.9339	0.2315	2.2535	0.1156	3.8344	0.1788	2.9271
p	0.6887	0.0002	0.8177	0.0279	0.9084	0.0003	0.8587	0.0048

3.2. Time of symptom disappearance and nursing satisfaction

The time for symptom disappearance in Group A was shorter than that in Group B, and the nursing satisfaction in Group A was higher than that in Group B, with $p < 0.05$. See **Table 3**.

Table 3. Analysis table of time of symptom disappearance and nursing satisfaction (%, $\overline{x}$ ± s)

Group	Time to temperature normalization (d)	Time to lung sound disappearance (d)	Time to cough disappearance (d)	Nursing satisfaction [n(%)]
Group A (n = 31)	2.81 ± 0.21	4.71 ± 0.32	4.61 ± 0.42	30 (96.77)
Group B (n = 31)	3.09 ± 0.33	5.21 ± 0.43	5.42 ± 0.55	25 (80.65)
Statistical value (t/χ^2)	3.9856	5.1938	6.5169	4.0260
p-value	0.0002	0.0000	0.0000	0.0448

3.3. Inflammatory factor indicators

After nursing care, the levels of PCT, WBC, and SAA in Group A were lower than those in Group B, with $p < 0.05$. See **Table 4**.

Table 4. Analysis table of inflammatory factor indicators ($\overline{x} \pm s$)

Group	PCT (ng/mL)		WBC (X109/L)		SAA (μg/mL)	
	Before	After	Before	After	Before	After
Group A (n = 31)	1.88 ± 0.25	1.02 ± 0.11	19.62 ± 0.72	9.79 ± 0.62	235.25 ± 6.29	68.44 ± 2.43
Group B (n = 31)	1.85 ± 0.28	1.29 ± 0.19	19.58 ± 0.74	11.42 ± 0.68	235.79 ± 6.31	73.59 ± 4.11
t	0.4450	6.8473	0.2157	9.8623	0.3375	6.0055
p	0.6579	0.0000	0.8299	0.0000	0.7370	0.0000

4. Discussion

Bronchopneumonia is associated with inflammation induced by lower respiratory tract infections. Affected by the deficiency of Yin Qi in children, after the invasion of cold, heat, and pathogenic factors, the lung heat in the body burns Yin fluid and accumulates phlegm, which can block the lung collaterals and cause the upward reversal of lung Qi, manifesting as shortness of breath, chest tightness, and cough. It should be treated with prescriptions that promote blood circulation to remove blood stasis and unblock collaterals, as well as clear and descend lung Qi, in order to prevent pathogenic factors from invading the jueyin meridian [4]. Acupoint application conforms to the traditional Chinese medicine concept of treating internal diseases with external methods, which can avoid gastrointestinal reactions and liver damage associated with oral medications. Moreover, the application of drugs through specific acupoint skin penetration can achieve multiple effects such as descending Qi, relieving asthma, and expelling phlegm [5,6]. In addition, traditional Chinese medicine acupoint application therapy allows drugs to permeate through the body surface and be directly absorbed through the skin, enabling the active pharmaceutical ingredients to reach the internal organs directly. This therapy can expel pathogenic factors, stimulate the functions of meridians and internal organs, and collectively achieve the effects of eliminating evil and strengthening the body as well as regulating Yin and Yang [7,8]. Based on this, combined with mechanical sputum drainage nursing, which vibrates the mucus in the deep fine bronchi, it can accelerate the discharge of sputum and help alleviate discomfort in pediatric patients.

Based on the data analysis in this article, after mechanical sputum drainage combined with traditional Chinese medicine acupoint application nursing, indicators such as FEV1, MMEF, FVC, and PEF improved. Analyzing the reasons, mechanical sputum drainage loosens airway mucus, reducing airflow resistance and improving airway patency. When combined with traditional Chinese medicine application, ingredients like asarum and ginger stimulate the relaxation of bronchial smooth muscle, relieving mucosal congestion and edema. Moreover, applying the patches to acupoints such as Danzhong (CV17) and Feishu (BL13) helps disperse and regulate lung Qi, thereby increasing the FEV1 level. The vibrating effect of mechanical sputum drainage reaches the peripheral airways directly, relieving the obstruction caused by secretions in the airways and optimizing airway ventilation function. When combined with traditional Chinese medicine application, ingredients like mint and perilla leaf soothe the throat and clear heat, reducing mucosal swelling and thus increasing the MMEF level. Mechanical sputum drainage accelerates the discharge of residual air and sputum retained in the airways, promoting lung expansion and increasing the effective ventilation volume of the lungs. When combined with traditional Chinese medicine application, astragalus ingredients can stabilize the exterior and replenish Qi, enhancing respiratory muscle

strength and increasing vital capacity, thereby increasing the FVC level [9,10]. In addition, mechanical expectoration can rapidly remove sputum from the proximal airways, reducing the instantaneous resistance to airflow expulsion and increasing peak expiratory flow rate. When combined with traditional Chinese medicine (TCM) patches containing ingredients such as ginger and asarone, which warm and invigorate Yang, bronchial spasms can be alleviated, leading to an elevation in PEF levels [11]. Another set of data indicates that after mechanical expectoration combined with TCM acupoint application nursing, the time for symptom disappearance in patients is shortened, and nursing satisfaction improves. Analyzing the reasons, mechanical expectoration accelerates the excretion of inflammatory factors in the respiratory system, reducing the stimulation of the thermoregulatory center by inflammation. Moreover, TCM ingredients such as asarone and ginger can dispel cold and expel pathogenic factors, while mint can relieve the exterior and clear heat, all of which can accelerate the recovery of body temperature in children. Mechanical expectoration rapidly clears respiratory secretions and sputum, relieving airway narrowing in children and accelerating the disappearance of pulmonary rales. TCM ingredients such as perilla leaf and platycodon can relieve cough and expectorate phlegm, and applying patches at the Feishu acupoint can regulate lung Qi and promote the absorption of inflammatory exudates in the lungs, helping to reduce airway edema and accelerate the disappearance of pulmonary sounds. Furthermore, mechanical expectoration can reduce the adverse stimulation of inflammatory secretions and sputum on the airway mucosa, lowering the frequency of cough reflex. Combined with TCM patch treatment, it can inhibit the cough reflex and reduce the severity of cough [12]. In addition, combined therapy rapidly improves airway ventilation function, alleviates uncomfortable symptoms such as dyspnea and hypoxia, and the application of traditional Chinese medicine (TCM) plaster can exert effects such as expectorating phlegm, anti-inflammation, and enhancing immunity, which is conducive to preventing the recurrence of symptoms in children with pneumonia, thereby resulting in higher satisfaction among the families of the children [13]. The last set of data indicates that after mechanical sputum elimination combined with TCM acupoint application nursing, the levels of inflammatory factors in children decrease. Analyzing the reasons, mechanical sputum elimination rapidly clears secretions related to airway infection foci and inhibits the colonization of pathogens in the body, thereby reducing the release of procalcitonin (PCT) and the synthesis of serum amyloid A (SAA). Moreover, when combined with TCM plaster therapy, the combined use of various Chinese herbal medicines exerts antibacterial and anti-inflammatory effects, inhibits inflammatory signaling pathways, and further reduces the levels of inflammatory factors in children [14]. Additionally, mechanical sputum elimination clears inflammatory necrotic tissues and pathogens from the airways, reducing the aggregation of white blood cells at inflammatory sites. When combined with TCM plaster therapy, Astragalus membranaceus can regulate immune system function and inhibit abnormal increases in white blood cells caused by excessive immune activation, facilitating the restoration of normal white blood cell (WBC) levels [15].

5. Conclusion

In summary, mechanical sputum elimination combined with TCM acupoint application nursing for children with pediatric bronchopneumonia can enhance parental satisfaction, reduce the levels of inflammatory factors in children, shorten the duration of symptoms, and improve lung function in children, demonstrating its value for widespread adoption.

Disclosure statement

The authors declare no conflict of interest.

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