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Efficacy of Multidisciplinary Team-Delivered Meridian-Based Acupoint Massage in Infants and Young Children with Community-Acquired Pneumonia: A Prospective Study

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Abstract

[Objective] To evaluate the efficacy of adding multidisciplinary team (MDT)-led meridian-acupoint massage to conventional treatment for infants with community-acquired pneumonia (CAP). [Methods] In this randomized trial, 100 infants with CAP were assigned to a control group (n=50) receiving conventional therapy or an intervention group (n=50) receiving conventional therapy plus MDT-led meridian-acupoint massage. Clinical efficacy, symptom resolution time, hospital stay, and family satisfaction were compared. [Results] Compared to the control group, the intervention group showed a significantly higher total effective rate (94.0% vs. 78.0%), faster resolution of fever, cough, and pulmonary rales, a shorter hospital stay, and higher family satisfaction (96.0% vs. 80.0%) (all $P < 0.05$). [Conclusion] Adding MDT-led meridian-acupoint massage to conventional therapy improves clinical outcomes, shortens recovery time, and increases family satisfaction for infants with CAP, demonstrating its strong potential for clinical application.

Keywords Community-acquired pneumonia; infants and young children; meridian-acupoint massage; multidisciplinary team; integrated Chinese and Western medicine

1 Data and Methods

1.1 General Information

This prospective study included 100 hospitalized infants and young children with community-acquired pneumonia (CAP), who were admitted between August 2022 and July 2023. Participants met the diagnostic criteria outlined in the *Guidelines for the Diagnosis and Treatment of Community-acquired Pneumonia in Children* [1]. Patients with congenital heart or lung diseases, immunodeficiencies, or severe complications were excluded.

The participants were randomly divided into a control group and an observation group using a random number table method, with 50 patients in each group. There were no statistically significant differences in baseline characteristics, including gender, age, and severity of condition ($P > 0.05$), indicating that the two groups were comparable.

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1.2 Intervention Methods

The **control group** received routine anti-infective therapy, nebulization, oxygen inhalation, nutritional support, and nursing care. In addition to the routine treatment, the **observation group** received a meridian-acupoint massage strategy delivered by a multidisciplinary team.

The implementation of this strategy involved several stages. First, a multidisciplinary team—comprising pediatricians, Traditional Chinese Medicine (TCM) practitioners, child healthcare specialists, and nurses—was formed to develop the *Guidelines for Meridian-acupoint Massage*. This protocol detailed the specific techniques: clearing and tonifying the spleen (1 minute), kneading the *Bandou* acupoint (1 minute), clearing the lung and calming the liver (3 minutes), transporting the internal eight trigrams (1 minute), kneading the *Ershanmen* acupoint (3 minutes), clearing the *Tianhe-shuǐ* (3 minutes), retreating the six *fu*-organs (1 minute), applying exogenous four methods (1 minute), and wiping the *Danzhong* (CV17) and lung acupoints until slightly red (1 minute). The procedure was performed once daily for a 10-day course, with each session lasting approximately 20 minutes. Following the protocol's establishment, and based on the *Operational Guidelines*, both medical staff and the children's family members received theoretical and practical training, and were permitted to perform the massage only after passing an assessment. Finally, to ensure quality, the Department of Traditional Chinese Medicine regularly monitored the standardization of the procedures and dynamically adjusted the acupoint prescription based on each child's individual condition. This study was approved by the hospital's ethics committee, and informed consent forms were signed by the children's legal guardians.

1.3 Observation Indicators

To evaluate the outcomes, several indicators were observed and recorded. These included: clinical efficacy (categorized as significant, effective, or ineffective); the time to resolution of major symptoms such as fever, cough, and lung rales; the total length of hospital stay; and family satisfaction, which was measured using a Likert 5-point scale.

1.4 Statistical Methods

Statistical analysis was performed using SPSS 26.0 software. Measurement data were expressed as mean $\pm$ standard deviation ($\bar{x} \pm s$) and compared using the t-test. Categorical data were expressed as rates (%) and compared using the χ^2-test. A P-value < 0.05 was considered statistically significant.

2 Results

2.1 Comparison of clinical efficacy

The total effective rate of the observation group was 94.0%, significantly higher than that of the control group (78.0%) ($P < 0.05$, Table 1).

2.2 Symptom improvement and length of hospital stay

The fever regression time (2.1 ± 0.5 days vs 3.4 ± 0.7 days), cough disappearance time (5.2 ± 1.1 days vs 7.6 ± 1.3 days), lung rales absorption time (4.0 ± 0.8 days vs 6.2 ± 1.0 days), and length of hospital stay (6.5 ± 1.2 days vs 8.8 ± 1.5 days) of the observation group were significantly shorter than those of the control group ($P < 0.05$, Table 1).

Table 1: Comparison of clinical efficacy and symptom improvement between the two groups (alternative layout)

Metric	Control group (n=50)	Observation group (n=50)	Statistic	P-value
Clinical efficacy [n (%)]			**$\chi^2 = 5.82$**	**0.016**
Excellent	20 (40.0)	30 (60.0)		
Effective	19 (38.0)	17 (34.0)		
Ineffective	11 (22.0)	3 (6.0)		
Total effective rate	39 (78.0)	47 (94.0)		
Time to symptom resolution ($\bar{x} \pm s$, d)				
Time to fever subsidence	3.4 ± 0.7	2.1 ± 0.5	t=10.97	<0.001
Time to cough resolution	7.6 ± 1.3	5.2 ± 1.1	t=9.78	<0.001
Time to lung rale resolution	6.2 ± 1.0	4.0 ± 0.8	t=11.34	<0.001
Length of hospital stay ($\bar{x} \pm s$, d)	8.8 ± 1.5	6.5 ± 1.2	t=8.21	<0.001
Family satisfaction [n (%)]	40 (80.0)	48 (96.0)	$\chi^2 = 6.12$	0.013

2.3 Comparison of laboratory indicators

The observation group showed significantly greater reductions in white blood cell count (7.6 ± 1.8 vs 9.8 ± 2.1, $P = 0.002$), neutrophil percentage ($52.3\% \pm 5.7$ vs $60.1\% \pm 6.5$, $P < 0.001$), and erythrocyte sedimentation rate (18.5 ± 5.3 vs 28.3 ± 7.1, $P < 0.001$) than the control group. After intervention, the IgA and IgG levels of the observation group were significantly increased (1.18 ± 0.28 vs 0.92 ± 0.24, $P < 0.001$), while there was no statistically significant difference in the control group ($P = 0.191$, Table 2).

Table 2: Comparison of laboratory indicators before and after intervention in two groups ($\bar{x} \pm s$)

Metric	**Group**	**Before Interv.**	**After Interv.**	**t/P Value (Intra-group)**	**Inter-group Diff. (95% CI)**	**Inter-group t/P Value**
WBC ($\times 10^9$/L)	Control group	12.5 ± 3.2	9.8 ± 2.1	$t = 5.21/0.001$	1.3 (0.8 – 1.8)	$t = 3.12/0.002$
	Obs. group	12.8 ± 3.5	$7.6 \pm 1.8^{\triangle}$	$t = 8.34/ < 0.001$		
N% (%)	Control group	68.4 ± 7.2	60.1 ± 6.5	$t = 4.87/0.001$	7.5 (5.2 – 9.8)	$t = 4.56/ < 0.001$
	Obs. group	69.1 ± 6.9	$52.3 \pm 5.7^{\triangle}$	$t = 9.12/ < 0.001$		
ESR (mm/h)	Control group	35.6 ± 8.4	28.3 ± 7.1	$t = 3.45/0.001$	9.8 (7.3 – 12.3)	$t = 5.78/ < 0.001$
	Obs. group	36.2 ± 9.1	$18.5 \pm 5.3^{\triangle}$	$t = 10.23/ < 0.001$		
IgA (g/L)	Control group	0.85 ± 0.21	0.92 ± 0.24	$t = 1.32/0.191$	0.2 (0.15 – 0.37)	$t = 3.89/ < 0.001$
	Obs. group	0.83 ± 0.19	$1.18 \pm 0.28^{\triangle}$	$t = 6.45/ < 0.001$		
IgG (g/L)	Control group					
	Obs. group					

Note: $^{\triangle}$ indicates the comparison before and after intervention in the group $P < 0.05$; CI is the confidence interval.

2.4 Awareness rate of TCM knowledge

After the intervention, the awareness rate of the observation group increased from 20.0% to 80.0% ($P < 0.001$), which was significantly higher than the 44.0% of the control group ($P = 0.001$, Table 3).

2.5 Family Satisfaction

The satisfaction of the observation group (96.0%) was significantly higher than that of the control group (80.0%) ($\chi^2 = 6.12$, $P = 0.013$, Table 4).

Table 3: Comparison of the awareness rate of TCM health care knowledge between the two groups [n(%)]

Group	n	Pre-interv. Rate (%)	Post-interv. Rate (%)	Intra-group χ^2/P	Inter-group Diff. (95% CI)	Inter-group χ^2/P
Control	50	12 (24.0)	22 (44.0)	$\chi^2 = 4.76/0.029$	30.0% (15.2-44.8)	$\chi^2 = 10.34/0.001$
Observation	50	10 (20.0)	40 (80.0)$^{\triangle}$	$\chi^2 = 32.14/ < 0.001$		

Note: $^{\triangle}$ indicates comparison with the control group, P<0.05. Scoring criteria: awareness rate = the proportion of those with a score of 80 or more; TCM knowledge questionnaire includes 10 items such as acupoint location and operation taboo, with a total score of 100.

Table 4: Comparison of parent satisfaction scores between the two groups (points, $\bar{x} \pm s$)

Group	Before Interv.	After Interv.	Intra-group t/P Value	Inter-group Diff. (95% CI)	Inter-group t/P Value
Control group	68.5 ± 10.2	80.3 ± 8.7	$t = 5.67/0.001$	$11.6\ (8.2 - 15.0)$	$t = 6.89/ < 0.001$
Observation group	67.8 ± 9.6	$93.4 \pm 5.1^{\triangle}$	$t = 14.32/ < 0.001$		

Note: $^{\triangle}$ indicates a significant difference compared to the control group after intervention (P<0.05).

3 Discussion

The pathogens of community-acquired pneumonia in children are complex, including bacteria, viruses, *Mycoplasma*, *Chlamydia*, fungi, and protozoa. Among them, viruses are the main cause of infant pneumonia, while *Streptococcus pneumoniae*, *Mycoplasma pneumoniae*, and *Chlamydia pneumoniae* are the main causes of pneumonia in children.

3.1 Analysis of therapeutic mechanism

Pediatric massage is based on the growth and physiological characteristics of children and is applied to specific parts of the body to produce therapeutic effects. It can help dredge meridians, promote qi and blood circulation, and relieve cough and resolve phlegm in children with pneumonia.

According to the theory of Traditional Chinese Medicine (TCM), CAP belongs to the category of "pneumonia and asthma", and its pathogenesis involves the attack of external pathogens on the lung and the stagnation of phlegm-heat. The massage of acupoints along the meridians can stimulate the lung meridian and related acupoints (such as Feishu, Danzhong, and Tiantu), dredge the meridians, regulate qi movement, and thus ventilate the lungs, resolve phlegm, strengthen the body's resistance, and eliminate pathogenic factors. From the perspective of modern medicine, the mechanism of acupoint massage may include: (1) Stimulating the skin receptor-spinal cord-cerebral nerve pathway to regulate the excitability of the vagus nerve, thereby alleviating airway spasms; (2) Promoting local blood circulation and lymphatic return, inhibiting the release of pro-inflammatory factors (such as TNF-α and IL-8) through the vagus nerve-cholinergic pathway, and accelerating the clearance of inflammatory mediators; (3) Enhancing serum immunoglobulin (such as IgA and IgG) levels to improve the defense capacity of the respiratory tract [3]. The results of this study were consistent with the study of Zhang *et al*., which further verified the synergistic effect of integrated traditional Chinese and Western medicine.

3.2 The practical significance of the multidisciplinary team model

Traditional Chinese external treatments in pediatrics are often limited by insufficient medical experience and a lack of standardized procedures. This study innovatively introduced a multidisciplinary team collaboration model: (1) the pediatric department and the TCM department jointly developed evidence-based acupoint prescriptions to ensure scientific and safe treatment; (2) the pediatric health department participated in rehabilitation management to reduce the risk of long-term lung function damage; (3) the *Oper-*

ational Guidelines standardized the connection between medical care and home treatment, particularly the family massage program. This helps extend the therapeutic effects beyond the hospital stay and provides a basis for home care, which is highly consistent with the "family-centered care" concept advocated by the WHO. In practice, 91.2% of family members reported being proficient in the massage techniques, indicating the model's high clinical feasibility.

3.3 Limitations and prospects

This study has the following limitations: (1) The conclusions from a single-center, small-sample study need to be validated through multi-center, large-sample studies; (2) It did not assess long-term recurrence rates or pulmonary function indicators; (3) It did not conduct stratified analyses of the dose-effects of acupoint massage, such as intensity and frequency. Future research could integrate dynamic monitoring of imaging and biomarkers (such as CRP and IL-6) to deepen the understanding of the mechanisms. It could also explore internet-based remote guidance models to enhance the standardization of home-based treatments.

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