Journal of Clinical and Nursing Research, 2024, Volume 8, Issue 6
http://ojs.bbwpublisher.com/index.php/JCNR
Online ISSN: 2208-3693
Print ISSN: 2208-3685

Analysis of the Efficacy of Xuebijing Combined with Antimicrobials in the Treatment of Intensive Care Unit Patients with Severe Pneumonia

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Abstract: *Objective:* To analyze the therapeutic effect of Xuebijing + antimicrobials in intensive care unit (ICU) patients with severe pneumonia. *Methods:* 60 ICU patients with severe pneumonia from June 2021 to June 2023 were selected and divided by the random number table method, with 30 cases in each group. The observation group received Xuebijing + antimicrobial treatment, while the control group received only antimicrobial treatment. The differences in rehabilitation indexes, test indexes, and inflammation indexes were compared between the two groups. *Results:* Mechanical ventilation time, fever reduction time, cough relief time, and hospitalization time of the observation group were significantly shorter than those of the control group ($P < 0.05$); C-reactive protein, procalcitonin, and white blood cell count of the observation group were significantly lower than those of the control group ($P < 0.05$); interleukin-6 and tumor necrosis factor-α of the observation group were significantly lower than those of the control group ($P < 0.05$). *Conclusion:* The treatment of severe pneumonia patients in ICU with Xuebijing + antibacterial drugs can reduce inflammation, enhance immune function, shorten the pneumonia recovery time, and reduce the adverse reactions of severe pneumonia.

Keywords: Intensive care unit severe pneumonia; Antimicrobials; Xuebijing; Efficacy

Online publication: July 23, 2024

1. Introduction

Severe pneumonia is a common critical illness in intensive care units (ICUs), with variable symptoms that can impair circulatory system function and organ function, as well as cause complications such as gastrointestinal hemorrhage and acute respiratory distress, even endangering the patient's life. In addition, patients with severe pneumonia may generate huge amounts of toxins in the body, resulting in the activation of inflammatory factors and promoting a series of biochemical cascade reactions, which leads to anti-inflammatory response disorders, further aggravating pneumonia; therefore, it should be diagnosed and treated as early as possible. Anti-infective treatment is the main treatment plan for ICU patients with severe pneumonia, but the current clinical application of many drugs for severe pneumonia treatment has led to the increasingly serious problem of antibacterial drug abuse, and some patients may develop antibiotic-resistant bacteria during treatment with antibiotics alone, which could affect the outcome of pneu-

monia. Xuebijing is a proprietary Chinese medicine, composed of a variety of Chinese herbs, with multiple effects such as eliminating blood stasis, activating blood circulation, and anti-inflammation, which is used in the treatment of severe pneumonia to soothe its symptoms. In this paper, 60 ICU patients with severe pneumonia admitted from June 2021 to June 2023 are taken as samples to explore the effect of Xuebijing + antibacterials.

2. General information and methods

2.1. General information

60 ICU patients with severe pneumonia admitted from June 2021 to June 2023 were selected and divided by the random number table method, with 30 cases in each group. The comparison of the data of the patients in the observation group and the control group found no significant difference, $P > 0.05$, as shown in **Table 1**.

Table 1. Analysis of the data of ICU patients with severe pneumonia

Groups	Gender		Age (years)		Duration of disease (d)	
	Male	Female	Interval	Mean	Interval	Mean
Observation group (n = 30)	19 (63.33)	11 (36.67)	61–76	68.18 ± 1.42	5–15	11.42 ± 2.14
Control group (n = 30)	20 (66.67)	10 (33.33)	61–77	68.21 ± 1.39	5–16	11.39 ± 2.16
χ^2/t	0.073		0.083		0.054	
P	0.787		0.934		0.957	

2.2. Inclusion and exclusion criteria

Inclusion criteria: (1) confirmed diagnosis of severe pneumonia; (2) informed consent; (3) respiratory rate > 30 times/min; (4) daily urine volume < 400 ml. Exclusion criteria: (1) abnormal mental state; (2) cardiovascular and cerebrovascular lesions; (3) malignant tumor.

2.3. Treatment methods

ICU patients with severe pneumonia were routinely given expectorants and antispasmodics, and at the same time, they had fluid replenishment, nutritional supplementation, and mechanical ventilation when necessary.

The control group received only antibacterial drug treatment, produced by the Zhengda Tianqing Pharmaceutical Group Co., Ltd: 0.3 g of Tiance (biapenem injection) mixed in 50 ml of 0.9% sodium chloride injection solution, administered via slow intravenous drip over 30 minutes; this was done every 6 hours for 7 days.

In the observation group, the antibacterial drugs were administered as per the control group + Xuebijing injection produced by Tianjin Hongri Pharmaceutical Co., Ltd.; Xuebijing was mixed with 100 ml of normal saline, administered via slow intravenous drip over 30–40 minutes, twice daily, for 7 days.

2.4. Observation indicators

(1) Rehabilitation indexes: The mechanical ventilation time, fever reduction time, cough relief time, and hospitalization time were recorded.

(2) Test indexes: 5 ml of morning fasting venous blood specimen was collected for evaluation of C-reactive protein (CRP) and procalcitonin (PCT) by radioimmunoassay, and white blood cells (WBC) count by hematology analyzer counting method.

(3) Inflammation indexes: 5 ml of morning fasting venous blood specimen was collected and interleukin-6 (IL-6) and tumor necrosis factor-alpha (TNF-α) were detected by enzyme-linked immunosorbent assay.

2.5. Statistical methods

The data were processed by SPSS21.0, % and χ^2 test for count data, mean ± standard deviation (SD) and *t*-test for measurement data. Statistical differences were indicated by $P < 0.05$.

3. Results

3.1. Comparison of rehabilitation indexes

Mechanical ventilation time, fever reduction time, cough relief time, and hospitalization time of the observation group were significantly shorter than those of the control group ($P < 0.05$), as presented in **Table 2**.

Table 2. Comparison of rehabilitation indexes (mean ± SD)

Groups	Mechanical ventilation time	Fever reduction time	Cough relief time	Hospitalization time
Observation group ($n = 30$)	4.71 ± 0.77	1.24 ± 0.54	4.25 ± 1.25	12.01 ± 1.27
Control group ($n = 30$)	10.24 ± 1.14	2.61 ± 0.87	6.81 ± 1.76	19.89 ± 1.36
t	22.018	7.328	6.495	23.195
P	0.000	0.000	0.000	0.000

3.2. Comparison of test indexes

After treatment, the CRP, PCT, and WBC of the observation group were significantly lower than those of the control group ($P < 0.05$), as shown in **Table 3**.

Table 3. Comparison of CRP, PCT, and WBC indexes (mean ± SD)

Groups	CRP (mg/L)		PCT (ng/ml)		WBC ($\times 10^9$/L)	
	Pre-treatment	Post-treatment	Pre-treatment	Post-treatment	Pre-treatment	Post-treatment
Observation group ($n = 30$)	24.84 ± 3.85	5.61 ± 1.11	5.64 ± 1.12	0.04 ± 0.01	19.71 ± 3.45	8.21 ± 1.06
Control group ($n = 30$)	24.81 ± 3.81	7.42 ± 1.49	5.61 ± 1.14	0.07 ± 0.02	19.69 ± 3.49	9.71 ± 1.24
t	0.030	5.336	0.103	7.349	0.022	5.036
P	0.976	0.000	0.919	0.000	0.982	0.000

3.3. Comparison of inflammatory indexes

After medication, IL-6 and TNF-α of the observation group were significantly lower than those of the control group ($P < 0.05$), as presented in **Table 4**.

Table 4. Comparison of inflammatory indexes (mean ± SD)

Groups	IL-6 (pg/L)		TNF-α (μg/L)	
	Pre-treatment	Post-treatment	Pre-treatment	Post-treatment
Observation group ($n = 30$)	187.42 ± 9.48	77.11 ± 4.25	30.16 ± 1.15	14.31 ± 0.84
Control group ($n = 30$)	187.39 ± 9.51	103.62 ± 5.16	30.18 ± 1.13	20.62 ± 0.96
t	0.012	21.721	0.068	27.094
P	0.990	0.000	0.946	0.000

4. Discussion

Severe pneumonia is relatively common in respiratory diseases, which can lead to death in ICU patients. The main characteristics of this disease are acute onset and rapid progression, and if the diagnosis and treatment are poor, it can lead to acute severe respiratory disorders, and even respiratory complications and neighboring organ complications, which may endanger patients' lives and health. The main causes of severe pneumonia are as follows: (1) Inflammatory response: During the progression of severe pneumonia, the level of inflammatory mediators and pro-inflammatory factors in the patient's body increases dramatically, which can induce inflammatory syndrome in the lungs, and even secondary immune paralysis, resulting in the spread of lung infection. (2) Coagulation disorders: A large number of inflammatory mediators in patients with severe pneumonia are released into the bloodstream, which can lead to the activation of the circulatory system coagulation function, affecting the body's coagulation, which in turn aggravates the progress of pneumonia. (3) Stress response: Infiltration of inflammatory factors can cause the body to undergo a stress response, leading to redox imbalance, when the level of intracellular oxygen radicals increases, leading to the destruction of proteins, cell nucleic acids, and other substances, manifested as impaired cell function. (4) Immune response: Excessive immune disorders, i.e., under the influence of inflammatory response, can lead to dysfunction of the body's immune system [1]. In addition, severe pneumonia requires diagnosis and treatment as early as possible, otherwise, a series of complications can be induced, endangering the life and health of patients. At present, it is not clear what causes severe pneumonia in ICU, but it is believed that more toxins in the body of patients with severe pneumonia can be combined with a variety of receptors and can also activate the inflammatory factors in the body, thus inducing biochemical cascade reactions, resulting in a disturbance of the anti-inflammatory balance, which can damage the body's capillaries and increase the risk of heart failure and other complications. Based on the above analysis of the hazards of severe pneumonia in ICU, after diagnosis of severe pneumonia, it is necessary to actively treat the patient's condition by giving anti-infective drugs, oxygen, immunomodulatory drugs, and expectorants. Based on the analysis of clinical practice, severe pneumonia is related to bacterial infection, so the commonly used treatment drugs are antibiotics, such as azithromycin, ceftazidime, and other drugs. However, under the influence of bacterial resistance, simple antibiotic treatment cannot exert effective anti-inflammatory effects. In recent years, some scholars have suggested the combination of Chinese and Western medicine regimens to treat ICU patients with severe pneumonia, in this paper, on the basis of conventional antimicrobial drugs, we chose the Chinese patent medicine Xuebijing for treatment and achieved excellent results.

Xuebijing is derived from the ancient Chinese medicine formula Xuefu Zhuyu Tang, which is made of *Salvia miltiorrhiza*, *Angelica sinensis*, safflower, and *Ligusticum chuanxiong*, with excellent medicinal effects. Dangshen (*Salvia miltiorrhiza*), which belongs to the heart meridian and liver meridian, can dispel blood stasis, invigorate blood circulation, eliminate carbuncles, cool the blood, relieve pain, and promote menstruation; *Angelica sinensis* belongs to the spleen meridian and liver meridian and can nourish and invigorate blood; safflower belongs to the liver meridian and can relieve pain, dispel blood stasis, soothe the menstruation and invigorate blood; and *Ligusticum chuanxiong* belongs to the gallbladder meridian and can dispel dampness and wind, relieve pain, and invigorate blood. The combined use of the above medicines can achieve the effect of removing blood stasis [2]. Based on modern pharmacological analysis, the intravenous administration of Xuebijing injection can antagonize human toxins and block the release of inflammatory mediators, which is conducive to the protection of endothelial cells and is suitable for the treatment of severe pneumonia in ICU [3]. In addition, Xuebijing injection can exert its efficacy at multiple targets in the human body, which is conducive to blocking the release of endogenous pyrogen and enhancing the immune function of the body [4]. On the basis of antimicrobial drugs, the combination of Xuebijing injection can have a synergistic effect, which is conducive to the

rapid restoration of the patient's body temperature, and then shorten the course of the disease [5].

Based on the results in this paper, the mechanical ventilation time, fever reduction time, cough relief time, and hospitalization time of the observation group were significantly shorter than those of the control group ($P < 0.05$). It is suggested that Xuebijing treatment of severe pneumonia in ICU can not only quickly relieve the symptoms of pneumonia, but also shorten the duration of the patient's illness. The reason for this is that Xuebijing is a safe pharmacodynamic component, which can rapidly exert its anti-inflammatory effect after entering the human body, and then reduce the amount of local inflammatory exudate, so the control of severe pneumonia is excellent [6]. In addition, Xuebijing can also optimize human microcirculation and improve lung function, and combined with antibacterial drugs, they can exert a synergistic effect to stop the cough; The main active ingredients of Xuebijing are traditional Chinese medicines, which enter the body through intravenous administration. They can lower the levels of toxins in patients, which helps stabilize vital signs such as blood pressure and arterial pressure. Xuebijing can stimulate the production of red blood cell antibodies in patients with severe pneumonia, thereby enhancing immunity. Therefore, it shortens the course of illness in severe pneumonia patients [7]. The results also showed that the CRP, PCT, and WBC of the observation group were significantly lower than those of the control group ($P < 0.05$). It suggests that the combination of Xuebijing injection on the basis of conventional antimicrobial therapy can enhance the treatment efficacy. The reason for this is that Xuebijing injection consists of Chinese herbs and is derived from Xuefu Zhuyu Tang. Among the herbs, saffron is rich in saffron yellow pigments that can resist platelet accumulation and stimulate vasodilatation and anti-inflammatory reaction, which is beneficial to the protection of vascular endothelial cells in patients with severe pneumonia; the various types of active ingredients in *Salvia miltiorrhiza* can inhibit the generation of oxygen radicals and resist platelet accumulation, which is beneficial to the enhancement of the protective effect of the lung tissues; the active ingredients in *Ligusticum chuanxiong* can stimulate vasodilation, promote circulation, dispel wind, and, based on its anti-inflammatory properties, help lower blood pressure; *Angelica sinensis* contains rich ferulic acid components, can regulate the body's immune system, and is conducive to enhancing antiviral effect, so after Xuebijing treatment, the level of leukocytes in the patient's body was significantly reduced [8]. Additionally, the results showed that IL-6 and TNF-α in the observation group were significantly lower than those in the control group ($P < 0.05$). This suggests that Xuebijing treatment can optimize the immune function and inhibit the inflammatory response. In summary, the advantages of Xuebijing treatment are as follows: (1) Clearing inflammation: Xuebijing pharmacological components can inhibit the body's secretion of inflammatory factors, such as IL-6 and TNF-α, as well as reduce the level of CRP and PCT, with excellent anti-inflammatory effect. In addition, high mobility group box protein 1 (HMCB1) has a pro-inflammatory effect in the human body, and the use of Xuebijing can inhibit the production of HMCB1 during the treatment, which can further inhibit inflammation in the body. (2) Optimizing coagulation function: Xuebijing can block the expression of platelet-activating factors such as CD62P and CD63, thus achieving the function of anti-platelet accumulation [9]. In addition, the pharmacological components of Xuebijing can regulate the level of fibrinogen and D-dimer, which is conducive to optimizing the coagulation function of patients with severe pneumonia; the pharmacological components of Xuebijing can also inhibit endothelial nitric oxide generation, thereby optimizing the function of the vascular endothelium and alleviating the oxidative stress response [10].

5. Conclusion

In conclusion, Xuebijing treatment for ICU patients with severe pneumonia can shorten the course of the disease, relieve the symptoms of pneumonia, and inhibit the production of inflammatory factors, which can be promoted and applied in patients with severe pneumonia.

Disclosure statement

The authors declare no conflict of interest.

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