



Clinical effects investigation of continuous plasma filtration with adsorption and continuous hemodialysis on improving the immune level of patients with sepsis in ICU

Yuan-Zheng Yang[✉]

Department of Critical Care Medicine; Affiliated Hospital of Hainan Medical University

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ABSTRACT

Objective: To investigate the clinical effects of continuous plasma filtration with adsorption and continuous hemodialysis on improving the immune level of patients with sepsis in ICU.

Methods: A total of 80 patients with sepsis were randomly divided into study group and control group, 40 patients in each group. All the patients were treated by routine treatment. Patients in study group were treated by continuous plasma filtration with adsorption and patients in control group were treated by continuous hemodialysis. The blood samples were collected before and after treatment. The immune cell level, inflammatory factors level, APACHE II score and death rate were compared between two groups. **Results:** All immune cell indexes were significantly improved in both groups. All immune cell indexes in study group were significantly better than those in control group, after treatment. All inflammatory factors were significantly decreased in both groups. All inflammatory factors in study group were significantly better than those in control group, after treatment. The APACHE II in study group was significantly better than that in control group, after treatment. The death rate in study group was significantly less than that in control group. **Conclusion:** Continuous plasma filtration with adsorption has a great clinical efficacy on patients with sepsis in ICU, which can improve the immune level and prognosis, makes it worth for clinical application.

1. Introduction

Sepsis is a common and critically ill disease, and its mortality rate is only lower than heart disease in the ICU, and is often associated with acute renal injury (AKI)[1]. In the early stage of sepsis, the inflammatory factors in the body are synthesized by the effects of endotoxin and other bacterial products. With the deterioration of sepsis, into anti-inflammatory or immune suppression condition, cause immune cells apoptosis signal changes, resulting in CD4⁺ T lymphocyte apoptosis, paralysis, specificity immune systems cause a vicious cycle anti-inflammatory treatment more difficult[2]. Studies have shown that inhibiting the apoptosis of CD4⁺ T lymphocytes reduces mortality in patients with sepsis. In the treatment of patients

with sepsis, blood purification is an important part of sepsis patients can be lowered by blood purification levels of inflammatory markers in the blood, the blood endotoxin level and improve the immune cells in the blood ratio[3,4]. However, with the continuous improvement of blood purification technology, blood purification methods are constantly changing. Continuous plasma filtration and continuous hemodialysis are two effective methods of blood purification[5,6]. Therefore, it is of great significance to compare the application effect of two methods in the treatment of sepsis.

2. Materials and methods

2.1. General information

In the 80 cases of sepsis from May 2015 to May 2016, According to the criteria established by the Chinese medical association in 2014[7] was confirmed. Randomly divided into the study group and

[✉]Corresponding author: Yuan-Zheng Yan, Department of Critical Care Medicine; Affiliated Hospital of Hainan Medical University.
Tel: 15103048576
E-mail: hhyangyuanzheng@163.com

the control group, each group of 40 patients. Study group: 23 males and 17 females; Aged between 21 and 65 years old, the average age is (27±5); Weight: 47.2-110.0 kg, average (61.2±11.3) kg. Control group: 24 males and 16 females; The average age is 24-68 years old, and the average age is (28±5) years; Weight 46.2-114.9 kg, average (60.7±18.3) kg. There was no statistically significant difference between the two groups in terms of gender, age, body mass and disease ($P > 0.05$).

2.2. Methods

All patients were in accordance with sepsis treatment guidelines for foundation treatment[7]: anti-infective therapy, and according to the illness needs applications such as dopamine, norepinephrine booster drugs to maintain blood pressure stable, and Applying respirator assist breathing and nutrition support.

2.2.1. Continuous plasma filtration adsorption

The application of the Sledinger technique to vein (internal jugular vein or femoral vein) was used to construct the vascular pathway. Application of German faison Multifiltration bedside blood purification machine produced by our company, application of Baxter PSHF1200 filter membrane filter should be replaced every 24 h. Using the optimized port formula for the displacement fluid formula, specific as follows: 6.4 mL of 10% calcium chloride + 3.2 mL of 25% magnesium sulfate + 820 mL of water sterilization + 5% glucose solution + 3 000 mL of normal saline, based on the patient blood potassium concentration and pH to adjust the input of 5% sodium bicarbonate and 15% potassium chloride. The input rate of the former dilution method is 3 000-4 000 mL/h, the displacement dose is 30-50 L/d, and the blood flow control is within 170-200 mL/min. The ultrafiltration rate is set to 60 mL/(kg.h), and the ultrafiltration rate should be controlled within 20%-25%. Anticoagulant measures: for the first time, 2 000-4 000 U low molecular heparin was applied. After four hours, the total clotting time was activated according to the dynamic monitoring, and the dosage was taken as appropriate. If the patient had bleeding tendency, the citric acid was used. Treatment time: 12 h for the first time and then adjusted for illness. Ultrafiltration: set according to the condition (physiological need and 24 h liquid treatment). If the patient is in stable condition, stop treatment.

Table 1.

The study group and the control group were compared with the immunocyte index before and after treatment ($n=40$).

Group	Time	CD3 ⁺ /CD45 ⁺	CD3 ⁺ CD4 ⁺ /CD45 ⁺	CD3 ⁺ CD8 ⁺ /CD45 ⁺	CD16 ⁺ CD56 ⁺ /CD45 ⁺	CD19 ⁺ /CD45 ⁺
Study group	Before	60.5±15.4	28.4±11.1	30.1±14.3	12.1±8.3	3.5±1.4
	After	73.2±13.0 ^{**#}	35.6±10.5 ^{**#}	43.2±7.6 ^{**#}	18.6±7.3 ^{**#}	5.3±2.0 ^{**#}
Control group	Before	59.6±13.3	28.4±13.3	29.8±13.1	10.6±5.0	3.0±2.0
	After	63.3±13.1 [°]	32.0±10.6 [°]	34.2±7.5 [*]	13.5±7.4 [°]	3.5±2.0 [°]

Compared with before treatment, [°] $P < 0.05$, ^{*} $P < 0.01$; Compared with the control group, [#] $P < 0.05$, ^{##} $P < 0.01$.

2.2.2 Continuous hemodialysis

The application of the Sledinger technique to vein (internal jugular vein or femoral vein) was used to construct the vascular pathway. Using Fresenius company's 4008B/4008S dialysis machine, F6 polysulfone membrane dialyzer, ultrafiltration coefficient 5.5 mL/(h x mmHg), blood flow rate of 250-300 mL/min, dialysate velocity 500 mL/min. For the first time, 12 h, then adjust the condition. Two or three times a week.

2.3. Observational index

In the extraction of the patient's blood samples before and after the treatment, flow cytometry is used to test two groups of patients before and after the treatment of CD3⁺/CD45⁺CD3⁺, CD4⁺/CD45⁺ and CD3⁺CD8⁺/CD45⁺, CD19⁺/CD45⁺, CD16⁺CD56⁺/CD45⁺ immune cells such as index, the Shanghai sangon company provide ELISA kit to determine the tumor necrosis factor alpha and interleukin-2, interleukin-6, endotoxin level of inflammatory factors such as, application of full automatic biochemical analyzer test, kidney function for APACHE-II score and mortality statistics and comparative analysis.

2.4 Statistics

Using SPSS 18.0 software package for statistical analysis, measurement data ($x \pm s$) indicated that the measurement data was tested by t; The counting data was tested by χ^2 . $P < 0.05$ was considered to be statistically significant.

3. Results

3.1 The study group and the control group were compared with the immunocyte index before and after treatment

Before the treatment, the group and the control group had CD3⁺/CD45⁺, CD3⁺CD4⁺/CD45⁺, CD3⁺CD8⁺/CD45⁺, CD16⁺CD56⁺/CD45⁺, and other immune-cell indicators ($P > 0.05$). After treatment, the immunocyte index of patients in both groups increased significantly compared with before treatment ($P < 0.05$, $P < 0.01$). Compared with the control group, the immunocyte index of the patients increased significantly, and the difference was statistically significant ($P < 0.05$, $P < 0.01$), and the specific results were shown in table 1.

Table 2.

The study group and control group were compared with the inflammatory factor level ($n=40$).

Groups	Time	IL-2(pg/mL)	IL-6(pg/mL)	TNF-a(pg/mL)	Endotoxin(ug/mL)
Study group	Before	29.3±10.1	112.4±23.0	1 450±630	585.2±200.1
	After	30.1±13.4	88.5±25.2 ^{**}	1 050±200 [#]	205.5±120.2 ^{**##}
Control group	Before	29.2±10.0	115.0±83.5	1 452±632	580.8±210.5
	After	30.0±13.5	98.5±24.6 [*]	1 250±400 [*]	380.6±160.2 [*]

Compared with before treatment, ^{*} $P<0.05$, ^{**} $P<0.01$; Compared with the control group, [#] $P<0.05$, ^{##} $P<0.01$.

3.2 The study group and control group were compared with the inflammatory factor level

Before treatment, the levels of TNF-alpha, IL-2, IL-6, endotoxin and other inflammatory factors were not statistically significant in the two groups of the study group and the control group ($P>0.05$). After treatment: IL-6, TNF-alpha and endotoxin of the group were significantly lower than before treatment ($P<0.05$, $P<0.01$). In the control group, IL-6, TNF-alpha and endotoxin were significantly reduced compared with the previous treatment ($P<0.05$). Group compared with control group, the patients of IL-6, TNF alpha, endotoxin and other inflammatory factor levels were significantly reduced, and the difference is statistically significant ($P<0.05$, $P<0.01$), the specific results are shown in table 2.

3.3 Two groups of patients with APACHE – II score and case fatality rate

After treatment, the team APACHE- II score and case fatality rate was significantly lower than control group, and the difference is statistically significant ($P<0.05$)

Project		Study group	Control group	χ^2/t	P
APACHE- II	Before	20.3±6.3	19.9±8.2	0.244	>0.05
	After	11.3±2.2 [*]	16.4±3.5	-7.80	<0.01
Fatality rate		42.5%(17) [*]	65.0%(26)	4.07	<0.05

Compared with the control group, ^{*} $P<0.05$.

4. Discussion

Sepsis occurs in 42 percent of patients in ICU, with a fatality rate of up to 60%, and most patients die from multiple organ disorder syndrome (MODS), complicated with sepsis. The dysfunction of endothelial cell function, coagulation activation and immune dysfunction caused by uncontrolled inflammatory response syndrome are the main causes of MODS. Therefore, to reduce the MODS and associated mortality associated with sepsis, we need to start from the control of inflammatory response to[10]. Blood purification is an effective treatment to improve the inflammatory level and related symptoms of sepsis. Continuous plasma filtration adsorption can maximize the simulation by means of hemofiltration kidneys cleared to fluid filtration method, the stable control of

water-electrolyte balance and acid-base balance, to reduce the concentrations of inflammatory markers in the blood and through the injection of low molecular heparin anticoagulation improve hemorheology in patients with sepsis and inflammation, make the patient's internal environment more in line with the normal physiological condition, more stable hemodynamics, the body fluid control better, with normal nutritional and metabolic support the implementation of the possible[11]. Continuous hemodialysis combines the patient's arteries with the artificial kidney through the arterial intubation, which allows the blood to flow along the pipeline of the dialysis membrane to the venous flow, and the external dialysis fluid[12], which flows in the opposite direction.

Studies have confirmed that the removal of inflammatory factors is beneficial to the prognosis of sepsis patients. This study confirmed that compared with the traditional treatment methods, using continuous plasma filtration adsorption to treat patients after various inflammatory factor levels in the blood were effectively improved except IL-2, and before treatment and the control group there were significant differences ($P<0.01$, $P<0.05$). It is suggested that the continuous plasma filtration adsorption has a good effect on the inflammatory response of patients with sepsis, which in turn increases the prognosis of patients with sepsis. However, it is important to note that the patients' IL-2 level did not show significant changes before and after treatment, and it was different from the existing research. The possible reason is the difference between the filter and the filter mode. However, there is no difference in the clinical efficacy, and it is proved that both models have good therapeutic effect. And by comparing the two groups before and after treatment in patients with immune level factor, confirmed that continuous plasma filtration adsorption also has good immune adjustment ability, the team in patients with CD4/CD8 ratio was significantly better than control group, confirmed by continuous filtration adsorption of plasma treatment, the patient's immune reconstruction ability is stronger, the immune function recover faster. The reason is that continuous plasma filtration adsorption improves the inflammatory response in the patient, thereby alleviating the immunosuppression of sepsis. The good treatment effect of continuous plasma filtration is also shown in the prevention of mortality. Team case fatality rate in patients with statistical differences with the control group, by inhibiting the patient's body inflammatory reaction continuous filtration adsorption of plasma

can effectively improve the curative effect of patients with sepsis, strengthen immune function in patients with sepsis patients with reconstruction, in order to reduce the mortality of sepsis, and save the patients' lives.

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