Biomedical Research 2017; 28 (20): 8881-8884 *ISSN 0970-938X*
www.biomedres.info

Clinical value of continuous blood purification in the treatment of septic shock from renal dysfunction.

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Abstract

Aim: To investigate the effect of continuous blood purification in the treatment of septic shock from renal dysfunction.

Methods: From January 2015 to August 2016, a total of 71 patients suffering septic shock from renal dysfunction were selected as the objects. All patients were randomly divided into control group (36 cases) and experimental group (35 cases). Patients in control group were treated with hemodialysis and those in experiment group were treated with continuous blood purification. The efficacy of those two treatments were analysed and compared.

Results: In the experimental group, there was significant difference in indicators of PH, HCO_3 and PaO_2 after treatment compared with pre-treatment ones, $P<0.01$. While, in the control group, there was significant difference only in indicators of pH and HCO_3 after treatment compared with the values before treatment, $P<0.01$. After treatment, the concentration of PH, HCO_3 and PaO_2 was 7.34 ± 0.02 mM, 23.9 ± 2.9 mM and 90.5 ± 7.5 mM in the experimental group and 7.25 ± 0.03 mM, 17.1 ± 2.6 mM and 66.2 ± 7.2 mM in the control group. Total effective rate was 85.71% (30/35) in the experimental group and 63.89% (23/36) in the control group.

Conclusion: Compared with conventional hemodialysis, continuous blood purification is better, thus worth being spread and applied in clinic.

Keywords: Hemodialysis, Continuous blood purification, Renal dysfunction, Septic shock.

Accepted on October 17, 2017

Introduction

Severe infection is the main cause of septic shock [1,2] and meanwhile will develop into systemic multiple organ dysfunction along with the further development of the disease followed by organ failure, deterioration of the condition and even death if serious [3,4]. In this process, liver and kidney failure, observed more commonly in the initial stage, are the leading cause of death in clinic, thus making it necessary to pay more attention to this kind of disease and the patients to maintain the stability of circulation function. Unfortunately, the conventional hemodialysis used nowadays is far from good enough to maintain the stability of circulation function. Hence, new methods for blood purification are still needed urgently. In our study, we investigated the effect of continuous blood purification in the treatment of septic shock from renal dysfunction. Our results showed that continuous blood purification was much better than the conventional hemodialysis in treatment of septic shock from renal dysfunction.

Materials and Methods

General information

From January 2015 to August 2016, a total of 71 patients suffering septic shock from renal dysfunction were selected as the objects. All patients were randomly divided into control group (36 cases) and experimental group (35 cases). Patients in control group were treated with hemodialysis and those in experiment group were treated with continuous blood purification. In the control group, there were 23 males and 13 females, aged from 25 to 77 at the average of 60.4 ± 12.7, 14 cases of severe pneumonia, 9 cases of diffuse peritonitis, 12 cases of suppurative cholangitis and 1 case of unknown disease cause. In the experimental group, there were 22 males and 13 females, aged from 27 to 75 at the average of 60.8 ± 12.5, 15 cases of severe pneumonia, 9 cases of diffuse peritonitis, 10 cases of suppurative cholangitis and 1 case of unknown disease cause. There was no significant difference in age, gender and other clinical data between two groups.

Evaluation index

Changes of such three blood gas indexes as PH, HCO_3 and PaO_2 after treatment were strictly monitored with comparative analysis of the three indicators in the two groups [5].

Efficacy evaluation criteria

Significant effect: 5 d after treatment, all clinical symptoms and signs of the patients disappeared or were completely improved and meanwhile all clinical indicators of the experiment returned to the standards within normal scope.

Effective: 10 d after treatment, all clinical symptoms and signs of the patients were alleviated to moderately great degree or improved significantly and all clinical indicators of the experiment restored to the level of normal range.

Invalid: 10 d after treatment, the clinical symptoms and signs of all patients had no change or underwent deteriorate.

Total effective rate=significant effect rate+effective rate.

Statistical analysis

The statistical analysis was performed with SPSS 22.0. Counting data was described as percentage and measurement data as mean ± standard deviation. T-test and Chi-square test were applied to determine the statistical significance. The difference is significant when $p<0.05$.

Results

Comparison of PH index before and after treatment

Before treatment, the PH value is 7.15 ± 0.20 in control group and 7.13 ± 0.21 in the experiment group. After treatment, the PH value becomes 7.25 ± 0.03 in control group and 7.34 ± 0.02 in the experiment group (Table 1).

Table 1. *Comparison of PH index before and after treatment.*

Group	Case	Before treatment	After treatment	t	P
Experiment	35	7.13 ± 0.21	7.34 ± 0.02	5.89	0.06
Control	36	7.15 ± 0.20	7.25 ± 0.03	3.56	0.09
t	-	1.52	14.83	-	-
P	-	1.00	0.08	-	-

Comparison of HCO3 index before and after treatment

Before treatment, the concentration of HCO_3 in control group is 14.4 ± 2.5 mM and 14.5 ± 2.3 mM in the experiment group. After treatment, the HCO_3 level becomes 17.1 ± 2.6 mM in control group and 23.9 ± 2.9 mM in the experiment group. The differences of before and after treatment in each group are significant. Moreover, after treatment, the difference in HCO_3 level between the experiment group and control group is statically significant (Table 2).

Table 2. *Comparison of HCO_3 index before and after treatment.*

Group	Case	Before treatment	After treatment	t	P
Experiment	35	14.5 ± 2.3	23.9 ± 2.9	15.02	0.01
Control	36	14.4 ± 2.5	17.1 ± 2.6	4.49	0.04
t	-	0.18	10.41	-	-
P	-	0.86	0.01	-	-

Comparison of PaO_2 index before and after treatment

Before treatment, the concentration of PaO_2 in control group is 66.6 ± 7.2 mM and 66.5 ± 7.3 mM in the experiment group. After treatment, the PaO_2 level becomes 66.2 ± 7.2 mM in control group and 90.5 ± 7.5 mM in the experiment group. Even though the difference of before and after treatment in experiment group is significant, no significant difference is observed in control group before and after treatment. Moreover, after treatment, the difference in PaO_2 level between the experiment group and control group is statically significant (Table 3).

Table 3. *Comparison of PaO_2 index before and after treatment.*

Group	Case	Before treatment	After treatment	t	P
Experiment	35	66.5 ± 7.3	90.5 ± 7.5	13.57	0.02
Control	36	66.6 ± 7.2	66.2 ± 7.2	0.23	0.82
t	-	0.06	13.93	-	-
P	-	0.95	0.01	-	-

Comparison of curative effects between the two groups

In the control group, significant effectiveness is observed on 17 patients and 6 patients are evaluated as effective. The total effective rate in control group is 63.89%. However, in the experiment group, 21 patients are evaluated as significant effective and 9 patients effective. Thus, the total effective rate in experiment is 85.71% (Table 4).

Table 4. *Comparison of curative effects between two groups.*

Group	Case	Significant effective rate	Effective rate	Invalid rate	Total effective rate

Experiment	35	60.00% (21/35)	25.71% (9/35)	14.29% (5/35)	85.71% (30/35)
Control	36	47.22% (17/36)	16.67% (6/36)	36.11% (13/36)	63.89% (23/36)
χ^2	-	-	-	-	4.47
P	-	-	-	-	0.03

Discussion

Cases died of septic shock mainly result from the disease of multiple organ dysfunction [6,7]. Usually, the death from this disease occurs 48 h after the diagnosis and therefore the involved patients should be diagnosed and confirmed as early as possible [8-10] and given replacement therapy of continuous blood pressure purification, which has been confirmed by the study with objective and practical significance in its existence and application [11]. Symptoms of the patients with renal failure often include platelet adhesion and aggregation dysfunction along with gradual decrease in the formation number of red blood cells. Blood coagulation factor would also go through slower formation while the number of inactivation would rise significantly, even likely to cause the combination between symptoms like anemia and vascular function disorder [12]. Chronic renal failure is often along with severe anemia symptoms or bleeding tendency [13] and for treatment of patients in this regard therefore, attention should be paid to the application of anticoagulants followed by taking corresponding intervention measures to avoid bleeding [14]. Blood dialysis method is most commonly used in traditional treatment of infectious shock from renal dysfunction [15]. In the process of this therapy, however, circulation of high blood flow often occurs, which will seriously damage liver and kidney function of the patients, especially of those under the state of shock who suffer from the injury most seriously and the blood flow of the patients with shock is very easy to cause power fluctuation [16]. Different from hemodialysis, continuous blood pressure purification can play a good role in inhibiting or reducing the mortality of such patients [17], able to uninterruptedly discharge the retention of excess moisture and solute to the eternal and regulate human body acid-base and electrolyte more accurately. It is a newly developed method of medical dialysis with its main mechanism being to gradually remove internal solutes like moisture, cytokines, small molecules toxins and mediators of inflammation in a slow and continuous manner by use of filter (high biological compatibility), then alleviate metabolic function and pulmonary gas exchange function of body tissues overall and meanwhile make the patients stable in hemodynamics. With duration of treatment, there would be too much fluid in the body and overload condition would be significantly improved, facilitating the restoration of body's internal environment with the maintenance of a stable state, decreasing the burden and damage on the kidney, and ultimately ensure the supplement of all the nutrients needed by body tissues of the patients [18]. At present, the use of continuous blood purification technology is no longer confined to alternative therapy for kidney disease with a great expansion in the application scopes such as severe acute pancreatitis, symptoms of septic shock along with renal dysfunction disease and complicating disease of multiple organ failure in which this treatment technology plays a significant effect. Many studies point out that septic shock from renal dysfunction has a certain fatality rate and the basic principle of its treatment is still early detection followed by diagnosis and therapy to improve the prognosis and reduce the mortality rate [19,20].

This group research was performed in 71 patients and the results showed that in the experimental group there was significant difference in indicators of pH, HCO_3 and PaO_2 after treatment compared with pre-treatment ones. While in the control group there was significant difference only in indicators of pH and HCO_3 after treatment compared with the values before treatment, proving the efficacy of treatment; And before treatment there was no significant difference in indicators of pH, HCO_3 and PaO_2 in the two groups while after treatment the value of PH, HCO_3 and PaO_2 was 7.34 ± 0.02 mM, 23.9 ± 2.9 mM and 90.5 ± 7.5 mM in the experimental group and 7.25 ± 0.03 mM, 17.1 ± 2.6 mM and 66.2 ± 7.2 mM in the control group. In the experimental group the total effective rate was 85.71% (30/35) including 60.00% (21/35) in significant effect rate and 25.71% (9/35) in effective rate. In the control group, the total effective rate was 63.89% (23/36) including 47.22% (17/36) in significant effect rate and 16.67% (6/36) in effective rate. Thus, compared with conventional hemodialysis, continuous blood purification enables to effectively reduce mortality and dysfunction of patients with septic shock from renal dysfunction and its curative effect improves obviously, thus worth promotion and application in clinic.

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