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Therapeutic effects of hemopurification on emergency patients with severe organophosphorous poisoning.

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Abstract

Objective: This research aimed to observe and analyze the clinical effect of hemopurification on emergency patients with severe organophosphorus poisoning.
Method: Eighty-four patients with severe organophosphorus poisoning who accepted treatment in our hospital from January 2015 to December 2016 were selected. Random number table was used to equally divide these patients into observation group (n=42) and control group (n=42) in which the former was given with conventional emergency treatment, and the latter accepted hemopurification treatment. Then, the curative effects of the two groups were compared.
Results: The total effective rate in treatment of patients in the observation group was significantly higher than that in the control group (P<0.05). The blood biochemical indexes of patients in the observation group were significantly superior to those in the control group (P<0.05). The atropine dosages of patients in the observation group were significantly less than those in the control group (P<0.05). The autonomous respiratory recovery time, consciousness recovery time, and the length of stay (LOS) of patients in the observation group were significantly shorter than those in the control group (P<0.05). The white blood cell (WBC), blood urea nitrogen (BUN), C-reactive protein (CRP), and creatinine (Scr) levels of patients in both groups were significantly lowered (P<0.05), and those of patients in the observation group were significantly lower than those in the control group (P<0.05).
Conclusion: Hemopurification treatment based on conventional emergency treatment had favourable curative effect on patients with severe organophosphorus poisoning, and it could effectively improve the blood biochemical indexes of the patients and shorten recovery time. Thus, hemopurification gained clinical popularity because of its significant applications.

Keywords: Severe organophosphorus poisoning, Emergency treatment, Hemopurification.

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Introduction

Severe organophosphorus poisoning refers to the fact that organophosphorus pesticides rapidly enter *in-vivo* ChE after entering the human body within a short time [1]. Thus, a large quantity of choline neurotransmitters are aggregated, which results to neurological function disorder and a series of damages cantering on respiratory functional failure and severe pulmonary edema [2,3]. Organophosphorus poisoning is a dangerous state of illness because it has a high fatality rate and endangers the life of the patient [4]. Therefore, taking timely and effective therapeutic measures is necessary for patients. Hemopurification was used in this research to treat the emergency patients with severe organophosphorus poisoning, and it had satisfying effects.

General Information and Method

General information

Eighty-four patients with severe organophosphorus poisoning who accepted treatment in our hospital from January 2015 to December 2016 were selected, and all patients conformed to the diagnostic standard of severe organophosphorus poisoning. This research obtained permission from the Medical Ethics Committee in our hospital, and the family members of patients signed informed consent forms. Random number table was used to equally divide these patients into observation group (n=42) and control group (n=42). The observation group was composed of 19 males and 23 females with their ages ranging from 35 to 74 years (average age: 52.77 ± 3.48). The poisoning dosage was 108.83 ± 22.67 mL, and the poisoning time was 3.24 ± 0.52 h. The control group consisted of 18 males and 24 females with their ages ranging from 37 to 72 years (average age: 53.24 ± 4.76). The poisoning dosage was 111.18 ± 21.93

mL, and the poisoning time was 3.36 ± 0.58 h. The differences between the two groups were not significant in gender, age, poisoning dosage, poisoning time, and other general information without statistical significance, and the two groups were comparable (P>0.05).

Therapeutic method

Patients in the control group accepted conventional emergency treatment. Contaminated clothes were removed. Clean water and 2% sodium bicarbonate solution or 1:5000 potassium permanganate solution were used for repeated gastric lavage until poisons in the stomach were completely cleared away, and then intravenous injection of trace-amount atropine (Nantong Jiuhe Pharmaceutical Co., Ltd; No. H32023917; specification: 1 mL: 0.5 mg) was given. Treatments like catharsis, dieresis, and assisted ventilation were given according to specific conditions of the patients. Based on all the given parameters, patients in the observation group were treated with hemopurification. Venous channels were set up. Purification was conducted through hemoperfusion (HP) and hematodialysis (HD). The intravenous injection of low-molecular-weight heparin (Shenzhen CIPRO Biological Pharmaceutical Co., Ltd; No. H200610191; specification: 1 mL × 5000 IU) as anticoagulant was implemented. Purification lasted 150-200 min. Blood flow velocity was 150~200 mL/min. Secondary treatment was given within 24 h upon rejection.

Observational indexes

The clinical effects, atropine dosages, autonomous respiratory recovery time, consciousness recovery time, LOS, and blood biochemical indexes of patients in the two groups were observed. Clinical effects were categorized into excellent, effective, and ineffective. The total curative effect was derived from the equation: (excellent+effective)/total number of patients × 100%. Biochemical indexes included white blood cell (WBC), blood urea nitrogen (BUN), C-reactive protein (CRP), and creatinine (Scr).

Statistical analysis

SPSS22.0 was used for statistical analysis in this paper. $\bar{x} \pm s$ represented measurement data; inter-group t test was implemented; "%" was enumeration data; and χ^2 test was implemented between groups. P<0.05 meant that differences were statistically significant.

Results

Comparison between two groups in curative effects

The clinical effects of patients in the observation group were significantly superior to those in the control group (P<0.05). Details are shown in Table 1.

Table 1. *Comparison between the two groups in curative effects.*

Group	Excellent	Effective	Ineffective	Total effective rate
Observation group (n=42)	26 (61.90%)	14 (33.33%)	2 (4.76%)	40 (95.24%)
Control group (n=42)	21 (50%)	13 (30.95%)	8 (19.05%)	34 (80.95%)
χ^2	/	/	/	9.735
P	/	/	/	0.002

Comparison between the two groups in treatment indexes

The atropine dosages of patients in the observation group were significantly less than those in the control group (P<0.05). Autonomous respiratory recover time, consciousness recovery time, and LOS were significantly shorter than those in the control group (P<0.05). Details are seen in Table 2.

Table 2. *Comparison between the two groups in treatment indexes.*

Group	Atropine dosage (mg)	Autonomous respiratory recovery time (d)	Consciousness recovery time	LOS (d)
Observation group (n=42)	44.24 ± 19.16	2.25 ± 1.78	8.24 ± 1.56	12.37 ± 2.82
Control group (n=42)	60.13 ± 20.48	4.68 ± 1.65	16.47 ± 3.49	19.23 ± 3.36
t	3.672	6.435	13.952	10.135
P	0.000	0.000	0.000	0.000

Comparison of blood biochemical indexes of two groups before and after treatment

The contrast differences between the two groups before treatment in WBC, CRP, BUN, and Scr levels were not statistically significant (P>0.05). The WBC, CRP, BUN, and Scr levels of the two groups after treatment significantly lowered (P<0.05), and those of the observation group were significantly lower than those of the control group (P<0.05). Details are shown in Table 3.

Table 3. *Comparison of blood biochemical indexes of the two groups before and after treatment.*

Group	Time	WBC (×109/L)	CRP (mg/L)	BUN (mmol/L)	Scr (μmol/L)
Observation group (n=42)	Before treatment	13.58 ± 2.27	18.35 ± 3.74	15.41 ± 3.06	238.52 ± 51.53
	After treatment	8.03 ± 1.19*#	8.06 ± 1.84*#	8.82 ± 1.64*#	126.67 ± 35.76*#
Control group (n=42)	Before treatment	13.64 ± 2.44	17.98 ± 3.47	15.54 ± 3.35	243.88 ± 61.21
	After treatment	10.93 ± 1.38*	12.36 ± 4=2.76*	11.37 ± 2.72*	164.16 ± 36.64*

Discussion

Organophosphorus poisoning, a common location disease in clinical emergency treatment, has high fatality rate. Nowadays, clinical pesticide poisoning is mainly organophosphorus poisoning that occupies 80% to 90% of cases involving high fatality rate and difficult treatment [5]. Gastric lavage and catharsis constitute a common effective method of eliminating pesticide poison, but poisons are mainly metabolized by the liver. As a result, some poisonous metabolites enter the intestinal tract through bile duct, and completely eliminating poison is difficult for single gastric lavage [6]. After gastric lavage through combined hemopurification, decontamination of the intestinal tract is conducted, and then continuous gastrointestinal decompression and drainage treatment are performed to completely eliminate gastrointestinal poison, improving clinical symptoms and clinical cure rates [7]. Previous clinical method is conventional, combining gastric lavage and atropine. However, conventional therapy can only reduce the decomposition of ChE by poisons but cannot completely clear away poisons in the blood of the patient. Therefore, therapeutic effect is not ideal [8]. Hemopurification refers to draining blood out of the body of the patient and eliminating morbid substances, such as metabolic waste and poisonous substances in the blood to attain hemopurification and disease treatment.

Researchers found through comparative experiment that the fatality rate of the treatment group (conventional treatment and hemopurification) was 5.7%, which was significantly lower than that (17.6%) in the control group (conventional treatment) [9]. The recovery time and LOS of patients in the treatment group were significantly lower than those in the control group (P<0.05). These findings indicated that hemopurification could rapidly and effectively eliminate poisons in organophosphorus pesticide, facilitate consciousness recovery within a short time, and improve cure rates [10]. The research indicated that the average LOS and recovery time in experimental groups were significantly shorter than those in the control group (conventional treatment, P<0.05). In this research, the total curative effect of patients in the observation group was significantly higher than that in the control group (P<0.05). The atropine dosage of patients in the observation group was significantly less than that in the control group (P<0.05). Autonomous respiratory recovery time, consciousness recovery time, and LOS in the observation group were significantly shorter than those in the control group (P<0.05). The WBC, CRP, BUN, and Scr levels of patients in the observation group were significantly lower than those in the control group (P<0.05). Research results indicated that hemopurification technology could effectively eliminate metabolic waste and poisonous substances in the blood of patients with organophosphorus poisoning, improve biochemical indexes and salvage success rates, and shorten consciousness recovery time and LOS.

Conclusion

To sum up, hemopurification treatment based on conventional emergency treatment has favorable clinical effects on patients with severe organophosphorus poisoning because it can effectively improve blood biochemical indexes and shorten recovery time. Therefore, hemopurification has gained clinical popularity because of its application values.

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