

Effects of High-Flux Hemodialysis on Inflammatory Factors and Nutritional Status in Patients with Severe Renal Failure

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Abstract: Objective: To investigate the effects of high-flux hemodialysis on inflammatory factors and nutritional status in patients with severe renal failure.

Methods: A total of 72 patients with severe renal failure who underwent dialysis treatment in the hospital from January 2017 to March 2019 were selected as the research subjects, and they were randomly divided into 2 groups with 36 patients each. The control group underwent low-flux hemodialysis, and the observation group underwent high-flux hemodialysis. The levels of inflammatory factors and nutritional status were compared between the two groups after treatment.

Results: The levels of various inflammatory factors in the observation group were lower than those in the control group and the nutritional indexes were higher than those in the control group after 4 weeks of treatment ($P < 0.05$). **Conclusion:** High-throughput hemodialysis in patients with severe renal failure can significantly reduce the levels of inflammatory factors and improve nutritional status.

Key words: Severe renal failure; High-flux hemodialysis; Inflammatory factors; Nutritional status

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1 Introduction

Severe renal failure is severe renal failure caused by the development of chronic nephritis, diabetes, hypertension, and hyperuricemia. Patients with severe

renal failure will have various complications such as acid-base and electrolyte imbalances, metabolites retention, and systemic multiple system disorders with a higher clinical mortality rate^[1-2]. Hemodialysis is the preferred treatment for advanced renal failure, which can alleviate clinical symptoms to some extent, but the incidence of complications such as malnutrition and inflammation after dialysis is still high^[3-4]. With the continuous development of new technologies, high-flux hemodialysis technology has been derived and widely used in clinical practice^[5]. The purpose of this study was to investigate the effects of high-flux hemodialysis on patients with severe renal failure on its inflammatory factors and nutritional status are shown as follows.

2 Materials and methods

2.1 General information

With the approval of the Medical Ethics Committee of the hospital, 72 patients with severe renal failure who underwent dialysis treatment in the hospital from January 2017 to March 2019 were selected as the research subjects and randomly divided into 2 groups with 36 patients each. There were 25 males and 11 females in the control group; aged 45 – 75 years, with an average of (56.65 ± 6.12) years. Meanwhile, there were 24 males and 12 females in the observation group; aged 45 – 74 years, with an average age of (56.47 ± 5.54) years. There was no statistically significant difference between the two groups of data ($P > 0.05$), and there was comparability. Patients voluntarily signed informed consent.

2.2 Methods

The control group was treated with German Fresenius FX10 low-flux dialyzer for hemodialysis, and Fresenius 4008s hemodialysis machine was used for volume control. The parameter settings are forearm intra-arterial fistula was the dialysis channel; ultrafiltration coefficient was 40 ml/mm Hg/h; the membrane area is 1.4-meter square; solution A uses Kangsheng original dialysate, solution B uses Kangsheng KC2003G3B dry dialysis powder; dialysis flow is 500 ml/min; blood flow is 250 ml/min; each dialysis time is 4h with 3 times/W. The observation group used German Fresenius FX60 high-flux hemodialyzer for hemodialysis. The ultrafiltration coefficient was 6.5 ml/mm Hg/h, the membrane area was 1.6-meter square. Other parameters were the same as those of the control group. Patients were monitored for vital signs and adverse reactions during dialyses, such as abnormal blood pressure and timely treatment with drugs.

2.3 Evaluation index

After 4 weeks of treatment, the levels of interleukin-6

(IL-6), interleukin-10 (IL-10) and tumor necrosis factor TNF- α in the blood of the two groups of patients were detected by enzyme-linked immunosorbent assay. Automatic biochemical analyzer (Japan Beckman Coulter KK) total protein (TP), albumin (Alb), hemoglobin (Hb) levels.

2.4 Statistical methods

SPSS 20.0 software was used for data processing to represent measurement data, the t-test was used, and $P < 0.05$ was considered statistically significant.

2.5 Statistical methods

SPSS 24.0 software was used for data processing. Count data were expressed as percentages and χ^2 test was used. $P < 0.05$ was considered statistically significant.

3 Results

3.1 Levels of inflammatory factors

After 4 weeks of treatment, the levels of inflammatory factors in the observation group were significantly lower than those in the control group. See Table 1.

Table 1. Comparison of inflammatory factor levels after treatment between the two groups ($\bar{x} \pm s$, ng/L)

Group	IL-6	IL-10	TNF- α
Control group (n=36)	155.75 \pm 14.12	28.69 \pm 3.25	78.41 \pm 7.56
Observation group (n=36)	130.28 \pm 13.66	21.34 \pm 2.79	65.63 \pm 6.42
<i>t</i>	7.779	10.296	7.731
<i>P</i>	0.000	0.000	0.000

3.2 Nutritional status

After 4 weeks of treatment, the nutritional level of the

observation group was significantly higher than that of the control group, and the difference was statistically significant ($P < 0.05$). See Table 2.

Table 2. Comparison of nutritional level between two groups of patients ($\bar{x} \pm s$, ng/L)

Group	TP	Alb	Hb
Control group (n=36)	64.02 \pm 3.23	36.86 \pm 4.68	80.69 \pm 4.12
Observation group (n=36)	67.25 \pm 3.37	44.06 \pm 3.57	89.87 \pm 5.20
<i>t</i>	4.152	7.339	8.302
<i>p</i>	0.000	0.000	0.000

4 Discussion

Renal failure is the result of the progressive development of nephrological diseases. Its main manifestations are renal dysfunction and chronic renal tissue dysfunction. As the disease progresses, it enters the stage of severe renal failure or uremia. Metabolic waste cannot be normally excreted and remains in the body, causing serious damage to the kidneys and other

organs, and a series of complications such as whole-body soreness, edema, and hypertension, which cause great pain to patients^[6-7]. Alternative therapies such as hemodialysis can effectively filter patients' excreta, toxins, and excess impurities through the filtration function of the dialyzer, thereby reducing the clinical symptoms of patients.

The results of this study show that the levels of various inflammatory factors in the observation group

were significantly lower than those in the control group after 4 weeks of treatment, and the nutritional levels were higher than those in the control group, suggesting that high-flux hemodialysis in patients with severe renal failure can significantly reduce the levels of inflammatory factors in patients to improve nutritional status. High-flux hemodialysis is based on the development of new material technologies. The use of nanofilament dialysis membranes as filtering materials can effectively avoid the occurrence of adverse events such as blood leakage and delamination and has good biocompatibility with human tissue fluids. It not only removes the small molecule solutes in the blood, but also effectively removes the medium and large molecular toxins, thereby improving the dialysis effect, and reducing the loss of blood nutrients because of removing toxins from the body^[8-9]. The high-flux hemodiafiltration membrane is a high-molecular polymer, which has good compatibility with the dialysate. It can form better membrane adsorption and convection circulation in the dialyzer, and effectively conduct various medium and large molecular toxins in the blood. Separation and transfer to achieve the purpose of removing impurities and toxins from the blood in a wide range. In addition, high-flux hemodialysis can reduce protein breakdown by reducing the number of medium and macromolecular toxins in the blood, reducing the production of inflammatory cytokines mediated by toxin stimulation, and reducing the low response pathway of erythropoietin induced by the inflammatory response, thereby reducing protein catabolism. At the same time, it is conducive to restore the proliferation and differentiation of red blood cell progenitor cells, increasing the sensitivity of bone marrow hematopoietic cells to erythropoietin, thereby increasing the appetite of patients, increasing the intake of various nutrients, and improving the nutritional status of patients.

In summary, high-flux hemodialysis in patients with severe renal failure can significantly reduce the level of inflammatory factors in patients and improve nutritional status.

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