Effect of peritoneal dialysis on inflammatory factors, nutritional index and renal function in patients with chronic renal failure

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Objective: To explore the effect of peritoneal dialysis on inflammatory factors, nutritional index and renal function indexes in patients with chronic renal failure, and to provide help for clinical treatment of patients with chronic renal failure. Methods: 80 cases of chronic renal failure patients in our hospital were selected as the study group, given peritoneal dialysis treatment; 80 healthy people during the same period in our hospital selected as the normal group. The inflammatory factors [C-reactive protein (CRP), interleukin-6 (IL-6), tumor necrosis factor-α (TNF-α) and IL-8], renal function indices [BUN (Urea nitrogen) and SCR (serum creatinine)] and nutritional index [PA (prealbumin), Hb (hemoglobin), ALB (albumin) and TF (Transferrin)] levels were detected in healthy population and patients with chronic renal failure patients before and after treatment of 1 and 30 d, and the relative significance was analyzed. Results: Compared with the normal group, the inflammatory factors (CRP, IL-6, TNF-α and IL-8) and renal function indices (BUN and SCR) of patients with chronic renal failure in study group increased significantly and nutritional indexes (TF, PA and ALB) decreased significantly (P<0.05). The inflammatory factors (CRP, IL-6, TNF-α and IL-8), nutritional index (TF, PA and ALB) and renal function indices (BUN and SCR) of patients with chronic renal failure by peritoneal dialysis in the treatment of 1 d in research group were significantly lower than the level before treatment, and Hb was significantly higher than that before treatment (P<0.05). After 30 d of dialysis, inflammatory factors (CRP, IL-6, TNF-α and IL-8), nutritional index (TF, PA and ALB) and renal function indices (BUN and SCR) decreased further and Hb increased further (P<0.05). Conclusions: Peritoneal dialysis can improve the inflammatory factors levels of patients with chronic renal failure, reduce the renal function index, and can affect the nutritional index of patients, and has important significance in clinical treatment of patients with chronic renal failure.

1. Introduction

Chronic renal failure is one of the chronic kidney diseases, patients accompany with renal parenchymal damage, renal dysfunction, acid-base imbalance and metabolite accumulation, and these symptoms pose a serious threat to the patients health[1,2]. Peritoneal dialysis is a common therapy for chronic renal failure, which can effectively protect the kidney, reduce the level of waste in the body, improve the symptoms and reduce the severity of the disease[3,4].

This study explored the changes of the level of inflammatory factors, nutritional index and renal function in patients with chronic renal failure before and after peritoneal dialysis treatment, and also explored the related mechanisms to provide important help of the clinical treatment of peritoneal dialysis for patients with chronic renal failure.

2. Materials and methods

2.1. General information

80 cases of chronic renal failure patients in our hospital from
September 2014–January 2016 were selected for the study group, 55 cases were male, 25 female; age 50–80, duration 1–3 years; 28 cases of chronic glomerulonephritis, 36 cases of diabetic nephropathy and 16 cases of hypertensive renal arteriosclerosis. 80 cases of healthy people of the same period examined in our hospital were selected, including 52 males and 28 females, aged 50–80 years. There was no difference in age, gender and weight between the two groups (P>0.05).

2.2. Selection and exclusion criteria

Patients with chronic renal failure who underwent renal failure criteria according to the K / DOQI guidelines (United States); Excluded patients with other heart failure, liver, gastrointestinal disorders, immune system disorders, and endocrine disorders; all chronic renal failure patients were in compliance with the relevant treatment standard of peritoneal dialysis. All the patients were conscious to be associated with the treatment and had no allergic reaction to the related drugs. The patients were not taking the drugs before and had detailed information before treatment. The study was conducted by the ethics committee approval and consent, and signed by the patient or their families after the implementation of informed consent.

2.3. Treatment method

Chronic renal failure patients were given water and salt management, blood glucose and blood pressure control and correction of acidosis, while peritoneal dialysis treatment, peritoneal dialysate from Baxter International Limited, the concentration of 2.5%, the dialysis dose is 4 000–6 000 mL/d, calcium concentration is 1.25 mmol/L, the dialysis time is 30 d.

2.4. Blood sample collection

5 mL fasting peripheral blood was collected from healthy people and patients with chronic renal failure before and after treatment 1 and 30 d, and then sent by the laboratory to detect the relevant indicators.

2.5. Cytokine detection

The tumor necrosis factor-α (TNF-α), C-reactive protein (CRP), interleukin-6 (IL-6) and interleukin-8 (IL-8) were determined by enzyme-linked immunosorbent assay (ELISA) provided by EnSightTM multi-mode microplate reader (PerkinElmer) in the determination of 450 nm absorbance OD value, and through the standard curve to calculate the corresponding concentration. The operating procedure was in strict accordance with the instructions.

2.6. Detection of renal function and nutritional indicators

BUN (Urea nitrogen), SCR (serum creatinine), PA (prealbumin), Hb (hemoglobin), ALB (albumin) and TF (Transferrin) were measured by using Hitachi 7180 automatic biochemical analyzer (Japan) to detect renal function and nutrition index, the experimental operation in strict accordance with the instructions.

2.7. Statistical analysis

Statistics and analysis of the data using SPSS20.0 statistical software, indicators of data representation, through the t test to compare the index data; the difference was statistically significant when P<0.05.

3. Results

3.1. Comparison of inflammatory factors in patients with chronic renal failure before and after peritoneal dialysis

Analysis of inflammatory factors CRP, IL-6, TNF-α and IL-8 of chronic renal failure patients before and after peritoneal dialysis treatment showed that before treatment in patients with chronic renal failure inflammatory, cytokines IL-6, CRP, TNF-α and IL-8 was significantly higher than that in normal group (P<0.05); Chronic renal failure patients after peritoneal dialysis after 1 d treatment, the level of inflammatory factors were significantly lower than the level before dialysis, and after 30 d treatment, the level of inflammatory factors decreased further with significant difference (P<0.05) (Table 1).

3.2. Comparison of nutritional indexes of patients with chronic renal failure before and after peritoneal dialysis

Analysis of nutrition index Hb, TF, PA and ALB of chronic renal

<table>
<thead>
<tr>
<th>Table 1</th>
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</thead>
<tbody>
<tr>
<td>Comparison of inflammatory factors in two groups of patients with chronic renal failure before and after peritoneal dialysis (n=80, x±s).</td>
</tr>
<tr>
<td>Group</td>
</tr>
<tr>
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</tr>
<tr>
<td>The normal group</td>
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<td>The research group</td>
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</tr>
</tbody>
</table>

Compared with the normal group, *P<0.05; compared with before dialysis, **P<0.05; compared with dialysis after 1 d, ***P<0.05.
Clinical treatment of chronic renal failure is particularly important.

Chronic renal failure is one of the chronic kidney diseases, due to various causes, patients accompany with chronic progressive renal parenchymal injury, renal atrophy, renal dysfunction, metabolic retention, acid-base balance, and the systemic system are affected[5,6]. Chronic renal failure has brought a serious impact to the patient’s daily life and work, and brought a heavy burden to the family[7]. The clinical treatment of chronic renal failure is particularly important.

At present, the treatment of chronic renal failure is mainly focus on improving symptoms, slowing down the decline in renal function and protecting the kidney[8]. Peritoneal dialysis is commonly used in the treatment of chronic renal failure, with a better way to maintain the stability of the cardiovascular system, protect the kidney and with the characteristics of low risk[9]. The study found that chronic renal failure patients often appear to a certain degree of inflammation and malnutrition status, which increased the patient’s condition[10].

To investigate the changes of inflammatory factors, nutritional status and renal function in patients with chronic renal failure after peritoneal dialysis is of great significance to the treatment of chronic renal failure.

In the present study, the levels of serum (CPR, IL-6, TNF-α and IL-8), nutritional indicators (TF, PA and ALB) and renal function (BUN and SCR) in chronic renal failure patients after one day of peritoneal dialysis were significantly lower than that before treatment (P<0.05), Hb was significantly higher than that before treatment (P<0.05), after 30 d of hemodialysis, inflammation (CPR, IL-6, TNF-α and IL-8) and nutritional index (TF, PA and ALB) and renal function indices (BUN and SCR) decreased further, and Hb increased further. Body toxins and metabolites retention, immune function, malnutrition and intestinal absorption of endotoxin and other often cause chronic renal failure patients with inflammatory reaction[11-13]. This study found that inflammatory cytokines after peritoneal dialysis was significantly lower, but still higher than the normal population (P<0.05). The decrease of toxin and metabolites in the patient’s body is beneficial to the reduction of inflammatory reaction. However, the stimulation of the body by the dialysate, the exit of the tunnel and the potential infection of the fistula stimulate the body, leading to the release of CRP, IL-6, TNF-α and IL-8 and other factors, causing damage to the body and slowing the rehabilitation of the patients[14,15]. In the process of peritoneal dialysis in patients with chronic renal failure, it is beneficial to reduce the severity of the disease, enhance the function of the body and promote the treatment of the disease. The nutritional indicators of chronic renal failure patients after continuous peritoneal dialysis decreased, patients with reduced nutritional intake, increased protein decomposition and reduced synthesis makes nutritional levels lower than the normal population in patients with chronic renal failure, peritoneal dialysis patients with severe protein loss and exacerbated...

### Table 2

Comparison of nutritional indicators of two groups of patients with chronic renal failure before and after treatment (n=80, t test).

<table>
<thead>
<tr>
<th>Group</th>
<th>Time</th>
<th>Hb (g/L)</th>
<th>TF (g/L)</th>
<th>PA (mg/L)</th>
<th>ALB (g/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The normal group</td>
<td>Before dialysis</td>
<td>131.94±10.13</td>
<td>3.97±0.34</td>
<td>381.87±12.33</td>
<td>44.41±3.26</td>
</tr>
<tr>
<td></td>
<td>1 d after dialysis</td>
<td>84.62±7.35</td>
<td>2.31±0.21</td>
<td>276.04±10.00</td>
<td>33.31±3.65</td>
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<tr>
<td>The research group</td>
<td>Before dialysis</td>
<td>87.11±8.04</td>
<td>1.89±0.13</td>
<td>269.31±10.26</td>
<td>31.19±3.06</td>
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<tr>
<td></td>
<td>1 d after dialysis</td>
<td>98.48±8.70</td>
<td>1.64±0.10</td>
<td>242.31±9.3</td>
<td>27.52±2.76</td>
</tr>
</tbody>
</table>

Compared with the normal group, *P<0.05; compared with before dialysis, #P<0.05; compared with dialysis after 1 d, $P<0.05$.

### Table 3

Comparison of renal function indexes before and after treatment in two groups of patients with chronic renal failure (n=80, t test).

<table>
<thead>
<tr>
<th>Group</th>
<th>Time</th>
<th>BUN (mmol/L)</th>
<th>SCR (μmol/L)</th>
</tr>
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<tbody>
<tr>
<td>The normal group</td>
<td>Before dialysis</td>
<td>4.68±0.45</td>
<td>37.38±3.05</td>
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<tr>
<td></td>
<td>1 d after dialysis</td>
<td>23.66±1.14</td>
<td>482.49±10.34</td>
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<tr>
<td>The research group</td>
<td>Before dialysis</td>
<td>20.01±0.98</td>
<td>461.05±10.05</td>
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<td></td>
<td>1 d after dialysis</td>
<td>15.14±0.81</td>
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Compared with the normal group, $P<0.05$; compared with before dialysis, *P<0.05; compared with dialysis after 1 d, #P<0.05.

### 4. Discussion

Chronic renal failure is one of the chronic kidney diseases, due to various causes, patients accompany with chronic progressive renal parenchymal injury, renal atrophy, renal dysfunction, metabolic retention, acid-base balance, and the systemic system are affected[5,6]. Chronic renal failure has brought a serious impact to the patient’s daily life and work, and brought a heavy burden to the family[7]. The clinical treatment of chronic renal failure is particularly important.

Analysis of renal function indexes BUN and SCR of chronic renal failure patients before and after peritoneal dialysis showed that before treatment, chronic renal function indexes BUN and SCR of in patients with renal failure was significantly lower than the normal group (P<0.05); chronic renal failure patients after peritoneal dialysis of 1 d, nutrition index TF, PA and ALB level was significantly lower than the level before peritoneal, Hb was significantly higher than that before dialysis, after treatment of 30 d, nutrition index TF, PA and ALB level further decreased significantly, the level of Hb further increased, and significant difference existed (P<0.05) (Table 2).

#### 3.3. Comparison of renal function index before and after peritoneal dialysis in patients with chronic renal failure

Comparison of renal function index before and after peritoneal dialysis in patients with chronic renal failure showed that before treatment, chronic renal function indexes BUN and SCR level was significantly lower than the normal group (P<0.05); Chronic renal failure patients after peritoneal dialysis of 1 d, renal function index BUN and SCR level was significantly lower than the level before dialysis, after 30 d treatment, renal function indexes of BUN and SCR levels decreased significantly, and significant difference existed (P<0.05) (Table 3).

### Table 3

Comparison of renal function indexes before and after treatment in two groups of patients with chronic renal failure (n=80, t test).

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<th>Group</th>
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Compared with the normal group, $P<0.05$; compared with basal, *P<0.05; compared with dialysis after 1 d, #P<0.05.
protein decomposition, and further affect the nutritional level of patients[16-18]. Changes in nutritional levels lead to decreased body mass, increased aggravation of renal insufficiency, and increased inflammation[19]. In the process of peritoneal dialysis in patients with chronic renal failure, timely and effective supplementary nutrition is beneficial to improve the function of the body and accelerate the cure of the disease. Renal function of patients with chronic renal failure after peritoneal dialysis treatment decreased, mainly because of peritoneal dialysis to promote the toxins and metabolic waste efflux, reducing renal function injury in patients, and promote the improvement of renal function[20-22]. Peritoneal dialysis can improve the level of inflammatory factors in patients with chronic renal failure, reduce renal function index, and can affect the nutritional indicators of patients with chronic renal failure, which is conducive to the clinical treatment of patients with chronic renal failure.

In summary, this study examined the changes of inflammatory factors (CRP, IL-6, TNF-α and IL-8), nutritional index (Hb, TF, PA and ALB) and renal function indices (BUN and SCR) levels in patients with chronic renal failure before and after peritoneal dialysis, and to explore the significance of inflammatory factors and the nutritional index and renal function changes of peritoneal dialysis in the treatment of chronic renal failure, to provide an important help for the treatment of chronic renal failure by membrane dialysis.

References