

# Analysis of the Short-Term Curative Effect of Roxadustat in Treating Renal Anemia in Patients with Peritoneal Dialysis

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**Abstract:** *Objective:* To analyze the short-term curative effect of roxadustat in the treatment of renal anemia in patients with peritoneal dialysis. *Methods:* 70 patients with peritoneal dialysis renal anemia admitted to the dialysis department of our hospital from March 2021–March 2023 were selected as research objects, divided into a research group and a reference group according to random number drawing method, with each group consisting of 35 cases. The patients in the research group were treated with roxadustat, and those in the reference group were treated with recombinant human erythropoietin. The total efficacy, anemia index, iron metabolism index, and occurrence of adverse reactions were compared between the two groups. *Results:* The total efficacy of the treatment received in the research group was significantly higher than that in the reference group ( $P < 0.05$ ). In terms of anemia indicators, there was no statistically significant difference between the hemoglobin (Hb), the red blood cell (RBC), and the hematocrit (HCT) of both groups ( $P > 0.05$ ) before treatment. After treatment, the anemia indicators of the patients in the research group were significantly better than those in the reference group, ( $P < 0.05$ ). In terms of iron metabolism, before treatment, there was no significant difference between the total iron-binding capacity (TIBC), the transferrin (TRF), the ferritin (FER), and iron (Fe) of both groups ( $P > 0.05$ ). After treatment, the research group's iron metabolism indicators were significantly better than those of the reference group ( $P < 0.05$ ). The incidence of adverse reactions in the research group was significantly lower than that in the reference group ( $P < 0.05$ ). *Conclusion:* The short-term curative effect of roxadustat in the treatment of peritoneal dialysis patients was demonstrated through this study, making it a viable treatment option.

**Keywords:** Roxadustat; Peritoneal dialysis; Renal anemia; Short-term efficacy

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## 1. Introduction

Peritoneal dialysis is an invasive method of treating end-stage renal disease, which involves using the human peritoneum as a permeable membrane for dialysis<sup>[1,2]</sup>. Peritoneal dialysis is a lifelong procedure, and long-term dialysis is likely to cause complications in the body, with renal anemia being the most common complication<sup>[3,4]</sup>. Renal anemia is a disease caused by decreased erythropoietin levels and iron metabolism

disorders. This disease will affect the normal physiological functions of the human body, induce cardiovascular and cerebrovascular diseases, and even affect the effect of dialysis. When renal anemia occurs after dialysis, symptomatic treatment should be taken as soon as possible. Recombinant human erythropoietin is a commonly used drug for the treatment of this disease. The drug can promote the formation of red blood cells, but it cannot cure iron metabolism disorders<sup>[5,6]</sup>. On the other hand, roxadustat is a drug used to correct anemia caused by chronic kidney disease. It can not only promote the proliferation of red blood cells, but also restore the normal metabolism of iron. It is widely used in the treatment of renal anemia in peritoneal dialysis<sup>[7]</sup>. The purpose of this paper is to study and analyze the short-term efficacy of roxadustat in the treatment of renal anemia in patients with peritoneal dialysis.

## 2. General information and methods

### 2.1. General information

70 patients with peritoneal dialysis renal anemia admitted to the dialysis department of our hospital from March 2021–March 2023 were selected as research objects, divided into a research group and a reference group using the random number drawing method, with each group consisting of 35 cases. The research group consisted of 20 males and 15 females, aged 34–76 years old, with an average of  $49.51 \pm 1.37$  years old. The reference group consisted of 21 females and 14 males, aged 35–76 years old, with an average of  $49.69 \pm 1.45$  years old. There was no statistically significant difference ( $P > 0.05$ ) in general information such as gender and age between the groups.

Inclusion criteria: (1) Diagnosed as peritoneal dialysis renal anemia, (2) not allergic to the drugs used.

Exclusion criteria: (1) Presence of blood system diseases, (2) presence of cardiovascular and cerebrovascular diseases, (3) presence of other organ failure, (4) presence of malignant tumors.

### 2.2. Methods

The reference group was treated with recombinant human erythropoietin: subcutaneous injection of 10,000 IU recombinant human erythropoietin, 1 time/week, for 3 months.

The research group was treated with roxadustat: 100 mg oral roxadustat capsules for patients of 45–60kg; 120mg/time for patients more than 60kg, for 3 months.

### 2.3. Observation indicators

- (1) The total efficacy of the treatment: markedly effective, effective, and ineffective.
- (2) Anemia indicators include hemoglobin (Hb), red blood cells (RBC), and hematocrit (HCT).
- (3) Iron metabolism indicators including total iron-binding capacity (TIBC), transferrin (TRF), ferritin (FER), and iron (Fe).
- (4) The incidence of adverse reactions between the groups was compared, including fever, nausea and vomiting, and abnormal blood pressure.

### 2.4. Statistical analysis

The data were processed and analyzed using SPSS 21.0. Count data were presented as the number of cases ( $n$ ) and percentages (%), and the  $\chi^2$  test was applied. Measurement data were expressed as mean  $\pm$  standard deviation, and the  $t$ -test was conducted. Statistical significance was determined at a significance level of  $P < 0.05$ .

### 3. Results

#### 3.1. Total efficacy

The total efficacy of treatment in the research group was significantly higher than that in the reference group ( $P < 0.05$ ), as shown in **Table 1**.

**Table 1.** The comparison of the total effective rate of treatment among the groups is as follows [(n)%]

Group	Number of cases	Markedly effective	Effective	Ineffective	Total efficacy
Research group	35	21 (60.00)	13 (37.14)	1 (2.86)	34 (97.14)
Reference group	35	19 (54.29)	10 (28.57)	6 (17.14)	29 (82.86)
$\chi^2$	-	-	-	-	3.9683
$P$	-	-	-	-	0.0463

#### 3.2. Anemia indicators

There was no statistically significant difference between the Hb, the RBC, and the HCT of both groups ( $P > 0.05$ ) before treatment. After treatment, the anemia indicators of the patients in the research group were significantly better than those in the reference group, ( $P < 0.05$ ), as shown in **Table 2**.

**Table 2.** The comparison of anemia indicators between both groups (mean  $\pm$  standard deviation)

Group	Number of cases	Hb (g/L)		RBC ( $\times 10^{12}/L$ )		HCT (%)	
		Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Research group	35	70.24 $\pm$ 3.25	105.97 $\pm$ 7.21	1.85 $\pm$ 0.21	3.81 $\pm$ 0.26	21.61 $\pm$ 2.31	37.22 $\pm$ 2.96
Reference group	35	70.45 $\pm$ 3.52	94.22 $\pm$ 6.37	1.89 $\pm$ 0.22	2.98 $\pm$ 0.34	21.65 $\pm$ 2.44	31.25 $\pm$ 2.97
$t$	-	0.2593	7.2253	0.7780	11.4722	0.0704	8.4230
$P$	-	0.7962	0.0000	0.4392	0.0000	0.9441	0.0000

#### 3.3. Iron metabolism indicators

Before treatment, there was no significant difference between the TIBC, the TRF, the FER, and the Fe of both groups ( $P > 0.05$ ). After treatment, the research group's iron metabolism indicators were significantly better than those of the reference group ( $P < 0.05$ ), as shown in **Table 3**.

**Table 3.** Comparison of iron metabolism indicators between both groups (mean  $\pm$  standard deviation)

Group	Number of cases	TIBC		TRF		FER		Fe	
		Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Research group	35	41.28 $\pm$ 2.69	55.24 $\pm$ 2.68	1.68 $\pm$ 0.15	2.91 $\pm$ 0.35	264.81 $\pm$ 10.24	182.42 $\pm$ 5.58	9.34 $\pm$ 1.22	12.59 $\pm$ 1.05
Reference group	35	41.35 $\pm$ 2.75	46.28 $\pm$ 2.59	1.66 $\pm$ 0.16	2.05 $\pm$ 0.52	264.93 $\pm$ 10.56	186.29 $\pm$ 5.36	9.53 $\pm$ 1.36	10.37 $\pm$ 1.64
$t$	-	0.1076	14.2227	0.5395	8.1169	0.0482	2.9590	0.6152	6.7444
$P$	-	0.9146	0.0000	0.5913	0.0000	0.9616	0.0042	0.5404	0.0000

### 3.4. Incidence of adverse reactions

The incidence of adverse reactions in the research group was significantly lower than that in the reference group ( $P < 0.05$ ), as shown in **Table 4**.

**Table 4.** The comparison of adverse reactions between both groups [(n)%]

Group	Number of cases	Fever	Nausea and vomiting	Abnormal blood pressure	Total incidence
Research group	35	1 (2.86)	1 (2.86)	0 (0.00)	2 (5.71)
Reference group	35	2 (5.71)	4 (11.43)	2 (5.71)	8 (22.86)
$\chi^2$	-	-	-	-	4.2000
$P$	-	-	-	-	0.0404

## 4. Discussion

The kidneys of patients with renal failure cannot function normally, and dialysis is needed to replace the kidney's function to maintain the normal circulation of the body [8,9]. Peritoneal dialysis involves introducing dialysate into the peritoneal cavity and utilizing the permeability of the peritoneum for dialysis [10]. Peritoneal dialysis can lead to complications in the case of irregular operation or patient intolerance, with renal anemia being the most common complication. Low hemoglobin in patients with this disease leads to anemia, and the lack of erythropoietin is the root cause of the disease. Renal anemia should be treated in time, otherwise, it will become life-threatening [11]. Promoting erythropoiesis is the main principle of the treatment of this disease, increasing the synthesis of red blood cells and increasing the content of hemoglobin, followed by supplementing iron to correct iron metabolism disorders [12]. Recombinant human erythropoietin is an active glycoprotein that has a certain effect on hematopoietic cells in the bone marrow, thereby increasing the formation of red blood cells and improving the symptoms of anemia [13]. However, patients with renal anemia will have some abnormalities in their iron metabolism, and this drug has no therapeutic effect on abnormal iron metabolism. Furthermore, the long-term use of this drug will cause abnormal blood pressure and increase the burden on the cardiovascular and cerebrovascular systems. Roxadustat can promote the synthesis of red blood cells, and the hypoxia-inducible factor in the drug can directly stimulate the expression of red blood cells and increase the level of hemoglobin [14]. Besides, it also promotes the absorption of iron and restores the normal metabolism of iron, making it highly effective for treating anemic symptoms [15].

## 5. Conclusion

In summary, the treatment of patients with renal anemia using peritoneal dialysis has led to a notable improvement in anemia symptoms. It has also partially restored iron metabolism, resulting in a highly impressive treatment effect.

## Disclosure statement

The authors declare no conflict of interest.

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