Effect of EPO erythropoietin combined with iron sucrose treatment on serum indexes and micro inflammation state of renal anemia patients who received hemodialysis

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ABSTRACT

Objective: To study the effect of EPO erythropoietin combined with iron sucrose treatment on serum indexes and micro inflammation state of renal anemia patients who received hemodialysis. Methods: 90 cases of renal anemia patients who received hemodialysis in our hospital from May 2013 to September 2014 were enrolled and randomly divided into two groups. Observation group received recombinant human erythropoietin combined with iron supplementation treatment; control group only received recombinant human erythropoietin treatment. Then serum index, oxidative stress index and micro inflammation state were compared. Results: (1) serum index: after treatment, hemoglobin, hematocrit, serum ferritin, transferrin saturation of observation group were higher than those of control group; (2) oxidative stress index: serum NOX2, AOPP, MDA contents of observation group were lower than those of control group; CAT, SOD and GSH-Px were higher than those of control group; (3) micro inflammatory state: serum NF-κB, AGEs, IL-6, IL-8, IL-17, IL-23 contents of observation group were lower than those of control group. Conclusion: EPO erythropoietin combined with iron sucrose treatment is helpful to improve anemia, alleviate oxidative stress and micro inflammatory state; it’s an ideal method of treating renal anemia with hemodialysis.

1. Introduction

Renal anemia is the most common complicated change of renal failure patients. Ideal effect can be achieved through recombinant human erythropoietin therapy. Hemodialysis is a common way to treat end stage renal disease. During dialysis, serum iron is eliminated from the body with dialysate, and the body is in a state of negative iron balance. Iron deficiency can lead to sufficient materials lacking during blood-forming process, and thereby affect the curative effect of erythropoietin. Therefore, erythropoietin therapy combined with iron supplement is of great value to improve the curative effect of renal anemia[1]. The research analyzed effect of EPO erythropoietin combined with iron sucrose treatment on serum index and micro inflammatory state of renal anemia patients who received hemodialysis.

2. Materials and methods

2.1. Clinical information

90 cases of renal anemia patients who received hemodialysis in our hospital from May 2013 to September 2014 were enrolled. Inclusive criteria were as follows: (1) with definitive diagnosis of chronic kidney disease; (2) complying with indications of hemodialysis treatment and receiving maintenance hemodialysis; (3) with renal anemia and hemoglobin content less than 80 g/L; (4) informing treatment risks and research matters and getting patients’ consents. Patients were randomly divided into two groups, each with 45 cases. Observation group, including 29 males and 16 females with age...
2.2. Treatment method

Both groups received recombinant human erythropoietin treatment. The process was as follows: initial dose of 80-150 U/(kg•week), continuing treatment for two weeks; monitoring hemoglobin content and if it reaches 110 g/L, reducing the dose by 25%. Observation group received iron supplement based on recombinant human erythropoietin treatment. The process was as follows: iron sucrose intravenous dripping, 100 mg each time and two times a week; testing emoglobin content after two weeks; calculating total iron amount of iron supplementation.

2.3. Testing indexes and methods

Blood analyzer was used to test Hb, HCT, SI, and TSAT, RIP kit was used to test contents of NOX2, CAT, GSH-Px, SOD, AOPP and MDA, and ELISA was used to test contents of NF-κB, AGEs, IL-6, IL-8, IL-17 and IL-23.

2.4. Statistical analysis

Data were tested by SPSS18.0 software for t test. Differences were considered to be significant at a level of P<0.05.

3. Results

3.1. Serum

Comparison before treatment: there were no differences between two groups’ serum indexes (P>0.05); Comparison before and after treatment: both groups’ Hb, HCT, SI, TSAT after treatment were higher than those before treatment; comparison after treatment: observation group’s Hb, HCT, SI, TSAT were higher than those of control group. Differences had statistical significance (P<0.05).

3.2. Oxidative stress

RIP was used to test oxidative stress indexes, and t test was used to analyze the differences of both groups’ oxidative stress indexes after treatment. It was found out that NOX2, AOPP and MDA contents were lower than those of control group, and that CAT, SOD and GSH-Px contents were higher than those of control group. Differences had statistical significance (P<0.05).

3.3. Micro inflammatory state

ELISA was used to test micro inflammatory state indexes, and t test was used to analyze the differences of both groups’ micro inflammatory state indexes after treatment. It was found out that observation group’s serum contents of NF-κB, AGEs, IL-6, IL-8, IL-17 and IL-23 were lower than those of control group. Differences had statistical significance (P<0.05).

4. Discussion

Renal anemia is one of the most common complications in patients with end stage renal disease, and it is closely related to multiple target-organ complications. Its main mechanism is that chronic renal failure can cause kidney damage, synthesis insufficiency and content decrease of erythropoietin, and that at the same time, metabolite accumulation in the body causes toxic damage to bone marrow hematopoietic tissue, inhibits hematopoietic function and leads to low reactivity of hematopoietic tissue to EPO[2]. Therefore, exogenous supplementation of erythropoietin is often chose as a main way to treat renal anemia. However, when patients of end stage...
renal disease receive hemodialysis, large amount of serum iron will be lost with dialysate, and the body is in a state of negative iron balance. Inadequate iron store in the body will directly affect EPO-stimulating hematopoietic function. After given plenty of EPO, patients’ red blood cells and hemoglobin levels are still relatively low, and anemia cannot be effectively improved[3]. This requires EPO combining iron supplement treatment, which supplies sufficient materials for bone marrow hematopoietic process[4]. The research supplemented iron through intravenous way. After absorbed through vein, iron enters directly into reticuloendothelial system and is stored in spleen, liver and bone marrow macrophage systems. When needed in hematopoietic process, it is remobilized and released. After combined with transferring, it enters bone marrow and supply medullary hematopoiesis[5]. The research analyzed both groups’ serum anemia-related indexes and found out that observation group’s Hb, HCT, SI, TSAT were higher than those of control group, which indicated that EPO erythropoietin combined with iron sucrose treatment could help improving renal anemia.

Chronic oxidative stress is one of the important pathologic changes in patients with chronic renal insufficiency. It’s also an important cause of cardiovascular system and nervous system complications. It will adversely affect patients’ prognosis. Oxidative stress exists in various stages of development of many kidney diseases and peroxidation increases with deterioration of renal function[6]. GMCs, leydig cell and renal tubular epithelial cell, etc can produce oxygen free radicals and become sources of oxidative damage[7]. NADPH oxidase/NOX family proteins are important sources of catalytic production of oxygen free radicals in the body, among which, NOX2 is mainly expressed in monocyte. It is considered to be catalytic core of NOX protein family. Activation of NOX2 can cause oxidative stress occurrence. Under physiological conditions, there are a variety of antioxidants in the body, which can protect the body against oxygen free radicals and become sources of oxidative damage[7]. NADPH oxidase/NOX family proteins are important sources of catalytic production of oxygen free radicals in the body, among which, NOX2 is mainly expressed in monocyte. It is considered to be catalytic core of NOX protein family. Activation of NOX2 can cause oxidative stress occurrence. Under physiological conditions, there are a variety of antioxidants in the body, which can protect the body against oxygen free radicals and become sources of oxidative damage[7]. NADPH oxidase/NOX family proteins are important sources of catalytic production of oxygen free radicals in the body, among which, NOX2 is mainly expressed in monocyte. It is considered to be catalytic core of NOX protein family. Activation of NOX2 can cause oxidative stress occurrence. Under physiological conditions, there are a variety of antioxidants in the body, which can protect the body against oxygen free radicals and become sources of oxidative damage[7]. NADPH oxidase/NOX family proteins are important sources of catalytic production of oxygen free radicals in the body, among which, NOX2 is mainly expressed in monocyte. It is considered to be catalytic core of NOX protein family. Activation of NOX2 can cause oxidative stress occurrence. Under physiological conditions, there are a variety of antioxidants in the body, which can protect the body against oxygen free radicals and become sources of oxidative damage[7]. NADPH oxidase/NOX family proteins are important sources of catalytic production of oxygen free radicals in the body, among which, NOX2 is mainly expressed in monocyte. It is considered to be catalytic core of NOX protein family. Activation of NOX2 can cause oxidative stress occurrence. Under physiological conditions, there are a variety of antioxidants in the body, which can protect the body against oxygen free radicals and become sources of oxidative damage[7]. NADPH oxidase/NOX family proteins are important sources of catalytic production of oxygen free radicals in the body, among which, NOX2 is mainly expressed in monocyte. It is considered to be catalytic core of NOX protein family. Activation of NOX2 can cause oxidative stress occurrence. Under physiological conditions, there are a variety of antioxidants in the body, which can protect the body against oxygen free radicals and become sources of oxidative damage[7].

Persistence of micro inflammatory state is a very common and hidden pathological state in renal anemia patients with hemodialysis. There is reciprocal causation between anemia and micro inflammatory state. There are also studies calling it “Malnutrition-Inflammation Complex Syndrome”, i.e. MICS[11]. Recent studies have shown that generation of micro inflammatory state in patients with renal anemia is related to many factors such as injury of residue macromolecule material, untimely clearance of inflammatory mediators and pro-inflammatory cytokines, biological incompatibility of dialysis membrane, and low hematopoietic capability, etc[12]. AGEs is the product of body metabolism. It can directly activate mononuclear macrophage and induce inflammatory response. Generation of inflammatory response can promote and increase generation of AGEs. Generation of AGEs and inflammatory response are with positive feedback regulation. AGEs is also considered a key molecule to cause micro inflammatory state[13]. NF-κB is an important kind of nuclear transcription factor in the body and it’s in a central position of the regulation process of immune response and inflammation response. It can promote expressions of inflammatory cytokines like IL-1, IL-6 and IL-8, etc. Inhibiting expression of NF-κB can alleviate micro inflammatory reaction[14]. IL-17 and IL-23 are newly discovered pro-inflammatory cytokines in recent years, involving in multiple processes of inflammatory response. IL17 is produced by immune cell Th17. It can induce neutrophil and monocyte proliferation and promote expression of cell surface adhesion molecules. It is an important inflammatory cytokine that causes inflammation cascade. IL-23 can induce Th17 cell maturation and differentiation and promote generation of IL-17. With IL-23 lacking, Th17 cell cannot survive or proliferate[15].

The research analyzed both groups’ inflammatory responses after treatment and found out that observation group’s serum contents of NF-κB, AGEs, IL-6, IL-8, IL-17 and IL-23 were lower than those of control group, which indicated that EPO erythropoietin combined with iron sucrose treatment could help alleviate inflammation state.

In conclusion, EPO erythropoietin combined with iron sucrose treatment is helpful to improve anemia, alleviate oxidative stress and micro inflammatory state; it’s an ideal method of treating renal anemia with hemodialysis.

References


