

Anemia Management in Peritoneal Dialysis Patients: Can an Iron Supplement Maintain a Normal Transferrin Saturation and Hemoglobin Level?

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The primary cause of anemia in dialysis patients is inadequate production of erythropoietin (EPO) by the dysfunctional kidneys. The EPO circulates in plasma and acts on erythroid progenitor cells in the bone marrow to produce red blood cells (RBCs). At the same time, chronic inflammatory diseases reduce the release of iron from storage sites, resulting in low transferrin saturation (Fe⁺ sat%). Anemia can cause fatigue and heart problems. Two main blood tests measure anemia: hemoglobin (Hb) measures the oxygen-carrying protein in RBCs, and Fe⁺ sat% measures Fe⁺ status in the bloodstream. The goal of anemia management is to maintain Hb levels at 11 – 12 g/dL and Fe⁺ sat% above 20%.

Key words

Anemia, transferrin saturation, red blood cells, hemoglobin, erythropoietin

Introduction

Most patients on dialysis are anemic because of inadequate production of erythropoietin (EPO) by the dysfunctional kidneys. The EPO circulates in plasma and acts on erythroid progenitor cells in the bone marrow to produce red blood cells (RBCs). At several different levels along the erythroid development cascade, EPO is formed by stimulation of the proliferation and differentiation of burst-forming units and colony-forming units. Further down the cascade, iron is added, and EPO stimulates the release of bone marrow reticulocytes (immature RBCs), which is a 10-day process.

The reticulocytes then mature and become RBCs in the bloodstream within 1 – 2 days (1,2).

Anemia also results when chronic inflammatory disease reduces the release of Fe⁺ from storage sites. The result is a decreased transferrin saturation (Fe⁺ sat%), which can cause fatigue, heart problems, and paleness of skin (1).

Two main blood tests are used to detect anemia:

- Hemoglobin (Hb) measures the oxygen-carrying protein in RBCs.
- Fe⁺ sat% measures Fe⁺ status in the bloodstream.

Table I lists the normal ranges for Hb and Fe⁺ sat% (2).

Other lab values that aid in measuring anemia are hematocrit, reticulocytes, reticulocyte hemoglobin, ferritin, and total iron-binding capacity (2).

There are three ways to treat anemia:

- Injections of EPO can be used to maintain normal Hb levels. The typical weekly dosage is 50 – 100 U per kilogram of body weight multiplied by 3. The EPO can be given in one, two, or three injections (2).
- When Fe⁺ sat% is below 20%, intravenous iron such as ferric gluconate complex (Ferrlecit: Watson Pharmaceuticals, Corona, CA, U.S.A.) can be given. The recommended dose is 125 mg once each week when ferritin is below 200 ng/mL, and 125 mg 1 – 4

TABLE I Normal ranges of hemoglobin and transferrin saturation

Hemoglobin	11–12 g/dL
Transferrin saturation	>20%

From: Carolina Dialysis–Carrboro, Carrboro, North Carolina, U.S.A.

times each month when ferritin is above 200 ng/mL (3).

- An iron supplement can be taken 1 – 3 times daily 1 hour before meals (4,5).

Peritoneal dialysis (PD) patients have the following iron requirements:

- 1 – 3 g annually
- 62.5 mg weekly (1)

Intravenous iron is administered by injection into a vein. Before intravenous iron is prescribed, it is recommended that a small dose be given by a doctor to check for allergic reactions or side effects. The dose and the length of treatment are partly based on the patient's age and medical condition (3).

Intravenous iron has several possible side effects (3):

- Drop in blood pressure
- Light headaches
- Weakness
- Fatigue
- Severe pain in chest, back, or groin
- Injection site reaction

Patients and methods

In a study conducted in 12 patients (ages 18 – 60 years), 9 of whom had a history of low Fe⁺ sat% and who had been on Fe⁺ supplements, all 12 patients were started on an Fe⁺ supplement (Fe⁺ sulfate or fumarate). Hemoglobin and transferrin saturation levels were monitored over 6 months (4).

Results

At the beginning of the study, the mean Fe⁺ sat% of the study patients was 26% (range: 12% – 36%), and the mean Hb was 11.9 g/dL. Six months later, the Fe sat%

had increased by 13%. In 4 patients the Fe⁺ sat% decreased to below 20% during the 6-month period. The mean Fe⁺ sat% increased to 29.25% (range: 19% – 49%) and the mean Hb stayed at 11.9 g/dL (see Table II).

This small clinic-based study indicates that PD patients taking an Fe⁺ supplement such as Fe⁺ sulfate or fumarate can prevent a low Fe⁺ sat% and maintain normal Hb levels. The use of iron supplements is more cost effective than, and can prevent or reduce the need for, intravenous iron (4,5).

Discussion

All patients on PD should be taking an Fe⁺ supplement, such as Fe⁺ sulfate, fumarate, or gluconate. Ferrous sulfate contains 60 mg Fe⁺, representing 20% elemental iron; ferrous fumarate contains 100 mg Fe⁺, representing 33% elemental iron; and Fe⁺ gluconate contains 35 mg Fe⁺, representing 11.6% elemental iron. All three supplements provide elemental iron and are absorbed in the gastrointestinal tract. These supplements can be bought over the counter or ordered from pharmaceutical companies (5).

Patients need to find out which Fe⁺ supplement they tolerate best. Patients can take Fe⁺ sulfate in doses of 300 mg, 324 mg, or 325 mg. Ferrous fumarate can be given in doses of 150 mg or 200 mg, and Fe⁺ gluconate can be given in doses of 300 mg, 325 mg, or 325 mg. Some Fe⁺ fumarate supplements contain stool softeners, which are recommended for patients who have constipation or who cannot tolerate Fe⁺ sulfate. However, patients should not take iron supplements if they experience gastrointestinal upset or if they have beta-thalassemia, ferritin above 800 ng/mL, or Fe⁺ sat% above 100% (4).

Conclusions

Use of an Fe⁺ supplement is cost-effective, because supplements are less expensive than IV Fe⁺. Use of a

TABLE II Results of anemia management study

	Baseline	6 Months
Patients (n)	12	12
Fe ⁺ sat% < 20%	9	—
Fe ⁺ sat% declined to <20%	—	4
Serum Fe ⁺ sat% [mean (range)]	26 (12–36)	29.25 (19–49)
Serum Fe ⁺ sat% increase	—	13
Hemoglobin (g/dL)	11.9	11.9

Fe⁺ sat% = transferrin saturation.

supplement can also reduce the need for clinic visits and reduce the required EPO dosage (4,5).

References

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