



Examination of the rate of hypochromic red blood cells for monitoring iron-deficiency in haemodialyzed patients

Tünde Csitkovics Toth¹ | Imre Kulcsar^{1,2}

¹ B. Braun Avitum Hungary, Dialysis Center 6, Szombathely

² Markusovszky Teaching Hospital, Szombathely, Hungary

Background

It is essential to monitor iron-deficiency in renal anaemic patients. The medical protocols proposed to measure transferrin saturation and serum ferritin levels.



Objectives

We have presumed that the hypochromic red blood cell rate (hRBCr) is a sufficient method for defining the measure of patients' iron-deficiency (ID).

Monitoring of the iron deficiency

- **Serum ferritin**
 - The serum ferritin level is an indication of iron stores.
 - Its level is affected by inflammation hepatic and malignant diseases.
 - One must interrupt the administration of i.v. iron two weeks before its checking.
 - The cost of serum ferritin level's check is relatively high.
- **Transferrin saturation (TSAT)**
 - It means the immediate iron availability for red blood cells (RBC) production is best assessed by measuring total serum iron and total iron-binding capacity (ratio of them in percentages).
- **Red blood cells haemoglobin concentration**
 - RBCs in renal failure are typically normocytic and normochromic. Microcytic changes or hypochromia suggest the presence of iron deficiency.
 - Percentage of hypochromic red cells is a simple lab test.
- **Other "iron" tests**
 - reticulocyt haemoglobin content
 - soluble transferrin receptor
 - serum transferrin level
 - hepcidin

Method

We measured hRBCr on a monthly basis in dialysis patients. The rate of hRBC >10% is absolute ID, between 5-10% is relative ID, and <5% ID excludes ID.

We analyzed our dialysis patients' haematology parameters, erythropoietin (EPO) and iron doses and the haemoglobin (Hgb) target achievement rate.

Patients

We treated 284 patients in 2011, 271 in 2012, 279 in 2013 and 281 in 2014 in chronic haemodialysis program. The mean age of them was 65,4; 65,8; 62,5; 62,6 years respectively. The monthly average chronic haemodialyzed patient's number was 184 (2011), 170 (2012), 173 (2013) and 178 (2014).

The rate of patients who received EPO was 97% (2011), 89% (2012), 84% (2013) and 86% (2014).

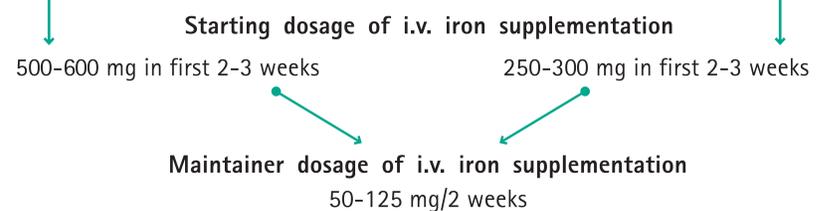
Types of iron deficiency

Absolute iron deficiency

- serum ferritin < 100 µg/L
- TSAT < 20%
- hRBCr > 10%

Functional iron deficiency

- serum ferritin > 100 µg/L
- TSAT < 20%
- hRBCr between 5-10%



Results

The rate of hypochromic red blood cell in our patients on chronic haemodialysis program between 2012-2014, quarterly



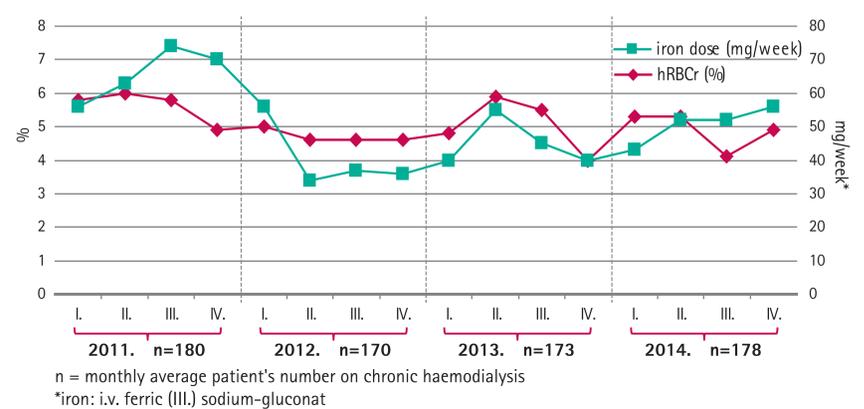
The mean of hypochromic red blood cell rate, intravenous iron dosage, the rate of reached target haemoglobin level (%) and erythropoietin dose in our dialysis centre between 2011-2014

Year	hRBCr %	iron dose mg/week	reached target Hgb %	EPO dose IE/kg/week
2011.	5.6	65.73	83.7	86.5
2012.	4.7	40.51	57.2	59.8
2013.	5.1	45.13	73.1	58.7
2014.	4.9	50.73	88.3	52.3

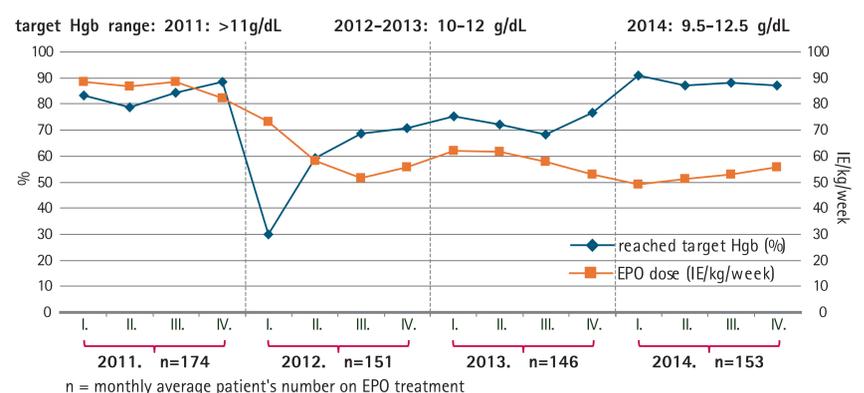
iron: i.v. ferric (III.) sodium-gluconat

target Hgb: 2011: >11 g/dL, 2012-2013: 10-12 g/dL, 2014: 9.5-12.5 g/dL

The mean hypochromic red blood cell rate and average iron dose between 2011-2014 quarterly



The reach of the mean target haemoglobin level and an average erythropoietin dose between 2011-2014, quarterly



Conclusions

Our experience verifies that hRBCr is an appropriate method for the identification of iron deficiency. It is a simple, cost effective and reliable labor tool. In the last 4 years we could control the iron status of our patients refining their iron need while also significantly decreasing the EPO dosage.

