Comparison of Serum Iron and Total Iron Binding Capacity Between Hemo and Peritoneal Dialysis Patients

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Abstract

In this study, 20 patients were selected having renal failure .10 patients were hemo& 10 peritoneal dialysis procedure. Patients had been given r HuEPO subcutaneous with supplement of Iron dextran after dialysis .Hemoglobin Hb concentration Hematocrit(Hct),serum Iron ,total Iron binding capacity, transferrin saturation percent Ts% & Serum ferritin were measured. Non significant changes in hemoglobin, hematocrit, serum Iron ,total Iron binding capacity ,transferrin saturation but a significant difference in serum ferritin was found ,this was ascribed to :

1- The blood lost in the peritoneal or hemodialysis for access .
2- Some patients had been given blood to treat anemia or given Iron supplements which leads to Iron overload.

Introduction

The total amount of Iron in the human bodies ranged between (4 -5)g.75% of it is in hemoglobin &25% are in such important compounds the cytochromes stored substances ferritin & hemosiderin & a very small amount in the plasma as Iron transporting protein transferring (1).

Iron is an essential element for the functioning of all biological systems (2) as a cofactor for many enzymes(i-e Oxidases Peroxides , Catalyses) (2,3) hem protein as an Oxygen carrier in hemoglobin & myoglobin also functions in the respiratory chain(4) there are seven cytochromes .e. (b ,C,C_1, α & α_3) are alike(5) ferritin is composed of a core ferrihydrite crystal (Fe_2O_3, $9H_2O$)x

within an apoferritin Shell .It occurs a Virtually all cell of the body & tissue fluids .The plasma serum ferritin concentration usually correlates with total body Iron stores , which makes the measurement important in the diagnosis of disorders of Iron metabolism (6) the term serum Iron refers to Iron in the plasma bound to it's specific plasma transport protein, transferrin, the β-globulin transferrin is the specific Iron transport protein in plasma. It has a molecular weight of about 80,000 Dalton & binds two Iron atoms per molecule .Serum transferrin is more often assayed by it's capacity to bind Iron & referred to as total Iron binding capacity (*TIBC*) it was expressed as moles Iron per liter which is equal to twice the concentration of transferring expressed in moles protein liter(7) Iron overloud is most common in patients with chronic renal failure treated with hemodialysis for a long time before treatment recombinant human erythropoietin [rHuEPO].They take Iron therapy or blood transfusion to treat anemia but this causes significant risks of viral hepatitis infection & Iron overloud &reduces the success of kidney transplantation (8)Erythropoietin is a glycoprotein hormone(9). It is encoded by gene on chromosome 7(10)the gene codes for a (193-amino acid peptide) from which α (27-amino acid) leader sequence is cleared during secretion ,leaving an active peptide of 166 amino acid (11) the kidney is the main source of EPO which is produced by interstitial per tubular cells in the cortex in response to hypoxia (12) .It is 34 Kda (mol. wt)glycoprotein hemapoietic growth factor capable of controlling the rate of red cell production (13) so that the principle of action of the hormone is to stimulate the proliferation &differentiation of Erythrocyte precursor(14) EPO production is markedly decreased in renal failure (5), however serum EPO levels remain within the normal range (5-25μU/ml).In the presence of anemia /hypoxia . Their level may rise to 10000 μU/ml or more (11) .The isolation of the human erythropoietin gene in 1983 followed by it's cloning& the expression of the mature glycoprotein hormone from the Chinese hamster ovarian cell resulted in the production of sufficient quantities of recombinant human erythropoietin [rHuEPO] .It was proved very effective in correcting anemia of chronic renal failure [CRF](14)the dose at the beginning ranged /3500-7000/ Unit subcutaneous supplemented with Iron in the form of Iron dextran /100-200/mg of Iron intravenous or fumarate dose(15)

Hemo Dialysis :- HD

Hemo Dialysis employs process of diffusion across a semi permeable membrane to remove unwanted substance from blood with adding desirable substance. A hemodialyzer is only a membrane separation device that functions as a mass exchanger during clinical use . It permits the transfer of noxious substance from the blood to dialysate so that they can be eliminated from the blood and discarded

Peritoneal Dialysis :- PD

Peritoneal Dialysis is accomplished by inserting a sterile plastic catheter into one of the pelvic gutters and irrigating the peritoneum with sterile solutions .(15)

Materials and Methods

The study included 20 patients with chronic Renal disease & Renal failure that required treatment with rHuEPO , 10patients mean age (48.2±14.1) who were studied had chronic hemo dialysis & 10 patients mean age (49.6 ±13.6) treated peritoneal dialysis with rHuEPO for at least 3 months the dose was 50U/kg /twice a week subcutaneous with supplemented Iron dextran intravenously dose was continued (100-200 mg of Iron dextran)after dialysis .

Dosage of rHuEPO was adjusted to maintain the target hematocrit of 28% to 33%.

All hemodialysis patients under went a 4-hours hemodialysis twice a week .

But peritoneal patients underwent 3 days peritoneal dialysis dependant on the patients condition

Statistical analysis : Data were expressed as comparison of the mean The students' test were used to analyze the results .

P. Value less than 0.05 was considered to be statistically significant .

Results

In this study, we show a non- significant difference between hemoglobin in the two group when measured so that in hematocrit like table (`1)

So that can show non- significant difference between serum Iron, total iron binding capacity & transferring saturation percent but we show a significant difference between serum ferritin in two groups ,we show this in table 2.

Discussion

Some patients in the end stage renal failure are anemic due to Iron deficiency or peritoneal & hemo dialysis procedure by other causes ,so that they must be taken rHuEPO with Iron dextran to treat anemic AL- Ibrahemia et al.2000(14) but some patients suffering Iron overload because they give Iron supplement or blood transfusion to treat anemia or Erythropoietin deficiency, when they are given rHuEPO .This initial Iron uptake simulate erythropoiesis & treat anemia but when treatment continues for a long time this may be due to Iron uptake deficiency because erythropoiesis is in need to Iron AL-Wihily etal.2001(15).

This study shows non- significant difference between serum Iron & transferrin saturation percent when comparison between hemodialysis patients& peritoneal dialysis was done because compliance might here been in complete in the group given oral supplements with rHuEPO this result agrees with Macdougall et al . 1996(16) study . So that all patients in this study treated by hemodialysis suffering from Iron deficiency because they lost a lot of blood by hemoddiclysis access due to Blood retention in the dialysis lines &filter addition sources of Blood less are related to Blood sampling for laboratory testing accidental bleeding from the Fistula& Occult gastrointestinal bleeding this result agrees with Eschbach et .al . 1987(17).

So that some patients in this study who are treated by peritoneal dialysis suffering from Iron deficiency because of the procedure &some patients didn't take rHuEPO &Iron supplement regular in the study, this may result in a non-significant difference when we compare them in these parameters.

we observed a significant difference in serum ferritin in this study when we compared between two groups this may result from any infection or inflammation that rise serum ferritin levels in hemodialysis .This study agrees with Gokal et .al.1979 (18)

The hemodialysis patients treated twice a week this results in an increment in the serum ferritin of the levels but peritoneal dialysis patients treated every month or three months this leads to an increase in serum ferritin levels less than hemodialysis patients in this study.

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Table (1) Demographic details of the two groups of patients included

	Hemodialysis patients	Peritoneal patients
No. of patients	10	10
Age years	48.2± 14.1	49.6± 13.6
Hb/dl	8.74± 0.9	8.08± 1.0
Hct%	26.88± 3.0	25.25±4.2

Hemoglobin/deciliter(Hb /dl), Hematocrat (Hct)

Table (2) Comparison between hemdialysis and peritoneal dialysis

	Hemodialysis	Peritoneal dialysis
No. of patients	10	10
Serum Iron	18.0 ±12.0	10.4±7.1
TIBC	36.9±14.2	28.0±8.6
TS%	43.1±16.6	42.7±19.5
Serum Ferritin	1060 ±375.6	66.5±420.2

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مقارنة حديد المصل والسعة الكلية لارتباطه عند مرضى الغسل الدموي والغسل الجوفي

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الخلاصه

تم في هذه الدراسة اخذ 20 حالة مصابين بالفشل الكلوي المزمن ، 10 منهم مستمرين على الغسل الدموي 10 على الغسل الجوفي وقد رافق هذه العملية اخذ علاج الاريثروبويتين المصنع تحت الجلد مع اخذ حديد الدكستران بعد الغسل وتم قياس تركيز الهيموكلوبين ونسبة كريات الدم الحمر ومستوى حديد المصل والسعة الكلية لارتباط الحديد ونسبة تشبع الترانسفرين وفرتين المصل .

ولم يلحظ وجود فرق جوهري واضح في هيموكلوبين الدم وكذلك نسبة كريات الدم الحمر ومستوى حديد المصل والسعة الكلية لارتباط الحديد ونسبة تشبع الترانسفرين بين المجموعتين ولكن وجد فرق جوهري واضح في فرتين المصل وذلك يعود الى :

1- فقدان الدم المستمر من جراء طريقة الغسل الجوفي او الدموي .
2- حصول ارتفاع مستوى حديد المصل بسبب اخذ الدم من قبل بعض المرضى لغرض معالجة فقر الدم او من جراء اخذهم جرع الحديد .