Original Article

Comparison of Intravenous with Oral Iron in Management of Iron Deficiency Anemia in Pregnancy

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ABSTRACT

Objective: To compare the therapeutic effect of intravenous and oral iron therapy in iron deficiency anemia of pregnancy.

Study Design: Quasi experimental comparative study.

Place and Duration of Study: This study was conducted in department of Gynecology and Obstetrics, Fauji Foundation Hospital Rawalpindi from Ist April 2007 to 31stDecember 2007.

Patients and Methods: One hundred pregnant women of confirmed iron deficiency anemia with hemoglobin levels between 7-8 gm/dl and serum ferritin level < 12ug/l were recruited from antenatal clinic and obstetrical ward and divided in two equal groups and assigned either intravenous or oral iron therapy. Patients not willing for follow up or had anemia due to other causes such as megaloblastic or hemolytic anemia were excluded from study. Pregnancy with renal and liver disease and patients with known allergy to iron were also excluded. Treatment efficacy was assessed after three weeks by estimating the hemoglobin and serum ferritin levels.

Results: An increase in hemoglobin was observed rising from 8.82 ± 1.01 g/dl to 10.9 ± 1.20 g/dl in intravenous group while in oral iron therapy group rise in hemoglobin from 9.32 ± 0.63 to 10.32 ± 0.62 gm/dl was observed (p< 0.00).The serum ferritin levels rise from 8.34 ± 2.73 to 30.3±7.68 ug/l in intravenous iron therapy while it was from 8.34 ± 2.71 to 11.26 ± 2.88ug/l in oral group (p< 0.00).

Conclusion: Intravenous iron therapy is more effective than oral iron therapy in raising the hemoglobin and serum ferritin levels in pregnant patients with iron deficiency anemia.

Key words: Iron sucrose complex, serum ferritin, iron deficiency anemia.

INTRODUCTION

Women in Pakistan suffer a lot of problems during pregnancy and iron deficiency anemia is the commonest single nutritional deficiency anemia[1].More than 50% women in reproductive age group are anemic or iron depleted mainly due to menstrual blood loss, inadequate iron intake or mal-absorption [2].The consequences of iron deficiency are serious and may result in low birth weight baby, increased preterm birth rate, perinatal mortality and irreversible brain damage .To avoid all these consequences intravenous (IV) iron sucrose has been found to be a safe line of treatment which corrects iron deficiency rapidly [3].It is also found that serum ferritin levels are raised more in intravenous therapy as compared to oral iron therapy[4].Intravenous iron therapy also corrects the depleted stores so that iron remains available for erythropoises[5].

Pregnant anemic patients need more iron and this requirement can be difficult to meet by oral iron because of poor compliance, limited absorption, interaction with food and physiological effect of pregnancy on digestion. It has been found that intravenous iron therapy is more effective and has fewer side effects like fever and skin allergy. These side effects can be avoided by dividing the total dose into smaller doses (100-200mg/day) and by the slow administration over 1-4 hours. It is concluded that intravenous iron sucrose complex is safe and effective treatment for iron deficiency anemia of pregnancy which can be successfully used as a day care case without hospitalization[6].

Our study was designed to compare the therapeutic efficacy of oral versus intravenous iron in pregnant patients with iron deficiency anemia by comparing pre and post treatment increase in hemoglobin (Hb) and serum ferritin levels.

PATIENTS AND METHODS

This study was carried out in the department of Gynecology and Obstetrics of Fauji Foundation Hospital Rawalpindi from 1st April 2007 to 31st December 2007.Hundred consecutive patients qualifying inclusion criteria were divided into two equal groups using table of random numbers.

Group A oral iron

Group B intravenous iron

Pregnant women with confirmed iron deficiency anemia between gestational ages of 12-32 weeks with hemoglobin level of 7-10 g/dl were included in the study. Patients not willing for follow up or had anemia due to other causes such as megaloblastic or hemolytic anemia were excluded from study. Pregnancy with renal and liver disease and patients with known allergy to iron were also excluded.

After informed consent patients who met the inclusion criteria were recruited from antenatal clinics and obstetric ward of Fauji Foundation Hospital. History

and ultrasonography were used to identify patients with appropriate gestational age (>12 weeks and <32 weeks).Hemoglobin was estimated to confirm diagnostic criteria (Hb 7-10 gm/dl) and confounding variables were controlled by identifying patients with megaloblastic or hemolytic anemia (peripheral film),renal disease (serum urea and creatinine levels) and liver disease (liver function test).Patients were told about the risk of intravenous iron therapy (skin allergy, fever) and oral therapy (diarrhoea, constipation ,black colored stools).Iron deficiency anemia was confirmed by complete blood picture (Hb 7-10 gm/dl), microcytic hypochromic picture on peripheral film and serum ferritin levels < 12ug/l.

Tests were done at Fauji Foundation Hospital laboratory Rawalpindi. Two groups were allocated to treatment using random number tables. Group A received tablet ferrous sulphate 300 mg (60 mg of elemental iron) orally three times per day (maximum oral dose). Study group B received total calculated amount of iron by following formula:

Hb deficit (g/l) x body weight (kg) x 2.21+1000. Group B received intravenous iron in divided doses in 200 mls of normal saline over one hour on alternate days after an initial test dose. All these cases were followed up after three weeks and their post iron therapy complete blood picture and serum ferritin were repeated from Fauji Foundation Hospital laboratory Rawalpindi. All information was recorded on specially designed proforma for analysis.

Statistical Test: Frequencies, mean and standard deviations for age, weight, hemoglobin and serum ferritin levels were calculated using descriptive statistics of SPSS version 12. One sample t-test was used to compare hemoglobin and ferritin levels before and then after 3 weeks of treatment in both groups. Independent sample t-test was used to compare mean hemoglobin and serum ferritin increase between two study groups. P-values ≤ 0.05 was considered statistically significant.

RESULTS

A total number of 100 patients met the inclusion and exclusion criteria. Fifty cases were given iron sucrose therapy and 50 cases were given oral iron therapy. The age distribution between two groups was not statistically significant i-e (p=0.223).The difference between mean gestational age and weight of two groups was statistically significant (p = 0.007) and (p=0.00) (Table no 1 and 2).The mean pretreatment hemoglobin of patients in Group A was 9.32 ± 0.63 g/dl and the post treatment hemoglobin in this group was 10.32 ± 0.62 gm/dl. The rise in the hemoglobin was statistically significant, p=0.00 by one sample t-test. The mean pre and post treatment hemoglobin of patients of group B was 8.82 ± 1.01 gm/dl and 10.9 ±1.2 gm/dl .The rise in hemoglobin was statistically significant (p=0.00) by one sample t-test. Therefore, both oral and intravenous iron significantly improved the patients post treatment hemoglobin. The mean rise in the hemoglobin in group A was 1.00 ± 0.36 gm/dl while it was 2.09 ± 0.51 gm/dl in group B. The mean rise in hemoglobin after treatment was significantly higher in intravenous route (group B) p = 0.028.The mean pretreatment serum ferritin in Group A was 8.34 ± 2.7ug/l , while the post treatment serum ferritin was 11.26 ± 2.88 ug/l. The rise in serum ferritin was statistically significant (p=0.00) by one sample t-test. The pre and post-treatment serum ferritin in group B was 8.25 ± 2.7ug/l and 30.5 ± 7.6 ug/l respectively. The rise in the serum ferritin was statistically significant, p=0.00 by one sample t-test The mean rise in the serum ferritin levels in group A was 2.95 ± 0.875ug/l while it was 21.7± 5.97 ug/l in group B. The mean increment in serum ferritin after the treatment was significantly higher in intravenous group; p=0.00.Therefore,intravenous iron therapy group achieved higher levels of hemoglobin and serum ferritin levels as compared to oral iron therapy.

Table No.I: Descriptive Statistics of Group A

	Minimum	Maximum	Mean	Std.Deviation
Age (years)	20.0	45.0	32.38	5.934
Weight(kg)	46.0	85.0	61.06	8.034
Gestational age(weeks)	18.0	35.0	27.06	4.181
Pre treatment hemoglobin (g/dl)	7.50	10.0	9.32	0.630
post-treatment hemoglobin (g/dl)	8.10	11.20	10.32	0.629
Pre treatment Ferritin in ug/l	3.39	11.80	8.34	2.713
Post treatment Ferritin in ug/l	3.40	18.55	11.26	2.881

Table No.2: Descriptive Statistics of Group B

	Minimum	Maximum	Mean	Std. Deviation
Age (years)	24.0	40.0	33.64	4.202
Weight (kg)	20.0	72.0	53.16	14.445
Gestational age (weeks)	20.0	34.0	29.46	2.977
Pre treatment hemoglobin (g/dl)	6.7	10.0	8.82	1.018
Post treatment hemoglobin (g/dl)	9.0	14.0	10.91	1.201
Pre treatment Ferritin (ug/l)	3.0	11.90	8.25	2.730
Post treatment Ferritin (ug/l)	18.0	60.42	30.53	7.684

DISCUSSION

Mothers in developing countries embark on pregnancy with low iron and other nutritional stores. Anemia occur in 10 to 30% of pregnant women[7].In countries with sub-optimal anemia management maternal mortality can reach 450/100,000 pregnancies, a similar figure in Europe 200 yrs ago[8].Oral iron therapy is has been shown to be effective in correcting iron deficiency anemia in most of the cases[9].Its efficacy is however limited in many cases due to dose dependent side effects, lack of compliance and insufficient duodenal absorption [10, 11]. By using IV iron rather than oral iron it is possible to increase Hb concentration to ideal threshold. IV iron is used increasingly in obstetrics[5, 12, 13,14,15.] In our study the mean rise in hemoglobin of oral therapy group was 1.00 ± 0.36 g/dl while it was 2.09 ± 0.51 g/dl in intravenous group. Surriaya also quoted an average increase of 1.85±0.28 g/dl in oral iron therapy and 3.45 ± 1.06g/dl in intravenous group[16]. The change in hemoglobin from baseline was significantly higher in the intravenous group than the oral group in the study by Aira[17]. Bayoumeu showed no advantage of IV sucrose over oral iron with regard to Hb increase [5].Professor Breymann reported that in 200 pregnancies the average increase in Hb over 25 days was 1.8 g/dl with use of iron sucrose. This is quite considerable and corresponds to two to three blood transfusion[18].The mean rise in serum ferritin in oral iron therapy was 2.95 ± 0.875 ug/l while the mean increment in intravenous therapy group was 21.76 ± 5.97ug/l which was highly significant as in studies by Bayoumeu and Aira[5,17] .Currently ,it has been shown that single dose of up to 200mg iron sucrose are safe and cumulative doses of up to 1600mg are sufficient to treat anemia. Side effects such as warmth, flushing, dizziness and some local reaction occurred in 0.4% of the patients .There have been no serious side effects, no severe tissue reaction and no deaths reported due to IV iron sucrose. Local data showed favorable results on safety, clinical and laboratory response of intravenous iron sucrose complex in iron deficiency anemia[19].Anemia in pregnancy is common in our part of world especially in pregnant women of low socio-economic class and in majority of them it is caused by nutritional deficiency of iron, folic acid or vit B12 [20] .It was also found that serum ferritin levels are raised more in intravenous therapy as compared to oral therapy[4].It was concluded that intravenous sucrose complex is safe, effective treatment for iron deficiency anemia of pregnancy; which can successfully be used as a day care without hospitalization[6].

Therefore, the available data show that iron sucrose is effective, safe and easy to handle in managing iron deficiency anemia during pregnancy and the postpartum; in addition it is associated with good acceptance and compliance.

CONCLUSION

Iron deficiency anemia during pregnancy is common and deserves special attention because of its potential consequences. Moreover, some pathological situations increase the risk of hemorrhage and require a rapid restoration of iron reserves. In practice physicians are often faced with poor compliance justified by digestive side effects that can lead to worsening anemia. In these cases the parenteral form of iron administration is the treatment of choice. Intravenous iron therapy is also very effective in cases where oral treatment is ineffective. It was concluded from our results that intravenous iron therapy is more effective than oral iron therapy in raising the hemoglobin and serum ferritin levels in pregnant patients with iron deficiency anemia. Intravenous iron sucrose should be used as valid first line therapy for the safe and rapid reversal of iron deficiency anemia during pregnancy.

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