10.5005/jp-journals-10006-1314

ORIGINAL ARTICLE

A Comparative Study to Evaluate the Efficacy and Safety of Single Dose Intravenous Iron Carboxymaltose *vs* Multidose Iron Sucrose in Postpartum Cases of Severe Iron Deficiency Anemia

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ABSTRACT

Objective: To evaluate the efficacy and safety of single dose intravenous iron carboxymaltose *vs* multidose iron sucrose in postpartum cases of severe iron deficiency anemia.

Materials and methods: One hundred cases with iron deficiency anemia in postpartum patient were selected from postpartum wards and assigned in two groups of 50 each. In group A, iron carboxymaltose injection administered by intravenous infusion upto a maximum single dose of 20 ml of iron carboxymaltose injection (1000 mg of iron). In group B Iron sucrose was given as 200 mg elemental iron (2 ampules of 5 ml) in 100 ml of 0.9% normal saline infusion over 15 minute alternate days up to 5 days. All the patients were monitored for rise in hemoglobin level at 2, 4, 8 and 12 weeks of iron therapy, adverse effect and rise in hematological parameter at 4 weeks.

Results: In group A, mean Hb level rise is 3.95 g/dl and in group B, it is 3.32 g/dl at 4 weeks of initial therapy. In group A, 100% cases achieved target Hb at 12 weeks after therapy while in group B 98% cases achieved target Hb at 12 weeks after therapy. In group A, 12% cases have grade 1 adverse reaction while in group B, 20% cases have adverse reaction.

Conclusion: Administration of intravenous iron has a good clinical result, with minimum adverse reactions. Thus, we can conclude that intravenous iron carboxymaltose therapy is safe, convenient, more effective and faster acting than intravenous iron sucrose for treatment of severe iron deficiency anemia in postpartum patient.

Keywords: Iron carboxymaltose, Iron sucrose, Iron deficiency anemia, Postpartum anemia.

How to cite this article: Garg R, Singh S, Singh S, Rajvanshi R. A Comparative Study to Evaluate the Efficacy and Safety of Single Dose Intravenous Iron Carboxymaltose *vs* Multidose Iron Sucrose in Postpartum Cases of Severe Iron Deficiency Anemia. J South Asian Feder Obst Gynae 2015;7(1):18-21.

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Source of support: Nil

Conflict of interest: None

INTRODUCTION

Iron deficiency is the most common nutritional deficiency worldwide; it affects 1.6 billion people (nearly a quarter of the world's population).[1]

Lack of iron supplementation during pregnancy and postpartum hemorrhage (PPH) are important causes of postpartum anemia (PPA). This is because pregnancy requires about 1000 mg of additional iron, which cannot be met by the typical diet.[2,3] Randomized clinical trials have shown that lack of prenatal iron supplementation is associated with low ferritin stores throughout the postpartum period. Similarly, women with IDA especially during the third trimester of pregnancy are more likely to suffer from PPA (postpartum anemia). It is also because IDA increases the risk of postpartum hemorrhage in these women. PPH is also an important cause of postpartum anemia.[4]

Over the past years, various routine methods, like oral iron, intramuscular iron and blood transfusions were used to treat anemia during postpartum period, but these methods have some defiencies.[5-7] Orally, given iron has side effects, like intolerance, nausea, vomiting, epigastric pain, diarrhea, constipation, unpredictable absorption rate and poor compliance.[8] Iron sorbitol given intramuscularly cause considerable pain, skin staining, bleeding, tissues necrosis, arthralgia, myalgia, sterile abscess atrophy and sarcoma formation.

So, to treat these conditions, we require a new mode of iron therapy with better efficacy, less side effects and better compliance. Intravenous iron carboxymaltose therapy seems to be a safe, convenient and more effective method for treating anemia during postpartum period than intravenous iron sucrose therapy.[8]

OBJECTIVES

The present study 'a study to compare the efficacy and safety of single dose intravenous iron carboxymaltose

and multidose intravenous iron sucrose therapy in postpartum patients of severe iron deficiency anemia'.

MATERIALS AND METHODS

Study was carried out in the Department of Obstetrics and Gynecology, SN Medical College, Agra, during a 2 year duration from October 2012 to 2014.

Sample Size

The study comprised of 100 cases which are to be randomly distributed into two groups consisting of 50 cases each.

Group A: Fifty cases in this group receive intravenous iron carboxymaltose therapy.

Group B: Fifty cases in this group receive intravenous iron sucrose therapy.

Inclusion Criteria

- All primi and multi patient
- All normal delivered and caesarean delivered patient
- Within 6 week of delivery.

Exclusion Criteria

- Patients with hemoglobin levels more than 7 gm%
- Normal serum iron levels
- Patients with history of allergic reactions to previous iron therapy
- Severe asthama/allergy
- Patients with other causes of anemia like:
  - Liver diseases
  - Renal disease
  - Hemolytic anemia
  - Infections.

Calculation of Total Iron Requirement

Iron deficit was calculated by the formula:

Total iron deficit = Iron deficit + amount of iron required to replenish stores

Iron deficit (mg) = Body weight (kg) × Hb deficit × 0.3

Hemoglobin (Hb) deficit = Target Hb – Initially measured Hb

Target Hb concentration = 11 gm%

Iron required to replenish = Body weight (kg)× 10 stores (mg)

Total iron dose required (mg) = 2.4×Body weight (kg) × (target Hb)

Actual Hb in g/dl + 500 mg

Iron Therapy

Group A: Intravenous injections (Iron carboxymaltose complex):

They are available as ampules of 10 ml containing 500 mg of elemental iron. Ferric carboxymaltose injection administered as follows:

Ferric carboxymaltose	*Iron*	*Maximum amount of sterile 0.9% NaCl solution*	*Minimum administration time*
10 to 20 ml	500 to 1000 mg	250 ml	15 minutes

Group B: Intravenous injections (iron sucrose complex)

They are available as ampules of 2.5 ml containing 50 mg of elemental iron.

Iron sucrose complex was given as 200 mg elemental iron (2 ampules of 5 ml) in 100 ml of 0.9% normal saline infusion over 30 minutes alternate days up to 5 days.

OBSERVATIONS

Table 1: Distribution of cases according to age

	Group A		*Group B*	
Age in years	*No.*	*%*	*No.*	*%*
<20 years	4	8	2	4
20-25	30	60	32	64
26-30	8	16	10	20
31-35	6	12	5	10
>35 years	2	4	1	2
Total	50	100	50	100
Mean age	25.50		25.56	

Table 2: Distribution of cases according to parity

	Group A		*Group B*	
Parity	*No.*	*%*	*No.*	*%*
1	10	20	12	24
2	18	36	16	32
3	10	20	10	20
>3	12	24	12	24
Total	50	100	50	100

Table 3: Distribution of cases according to socioeconomic status (modified BJ Prasad classification)

	Group A		*Group B*	
Socioeconomic status	*No.*	*%*	*No.*	*%*
Class V (poor)	9	18	9	18
Class IV (lower middle)	35	70	34	68
Class III (upper middle)	6	12	7	14
Class II (high)	—	—	—	—
Class I (upper high)	—	—	—	—
Total	50	100	50	100

Table 4: Hemoglobin level before starting therapy

Hemoglobin level (gm/dl)	Group A		Group B	
	No.	%	No.	%
<4	1	2	2	4
4–6	13	26	14	28
6-7	36	72	34	68
Total	50	100	50	100
Mean	6.14		6.06	
p-value	0.001			

The mean hemoglobin level before starting therapy in group A was 6.14 gm/dl. The mean hemoglobin level before starting therapy in group B was 6.06 gm/dl

Table 5: Hemoglobin level 2 weeks after starting therapy

Hemoglobin level (gm/dl)	Group A		Group B	
	No.	%	No.	%
5-7	6	12	9	18
7.1-9	32	64	29	58
9.1-11	14	28	12	24
Total	50	100	50	100
Mean	8.66		8.01	
p-value	0.002			

The mean hemoglobin level after 2 weeks of starting therapy in group A was 8.66 gm/dl. The mean hemoglobin level after 2 weeks of starting therapy in group B was 8.01 gm/dl

Table 6: Hemoglobin level 4 weeks after starting therapy

Hemoglobin level (gm/dl)	Group A		Group B	
	No.	%	No.	%
5-7	—	—	1	2
7.1-9	10	20	12	24
9.1-11	38	76	36	72
>11	2	4	1	2
Total	50	100	50	100
Mean	10.01		9.38	
p-value	0.001			

The mean hemoglobin level at 4 weeks in group A was 10.01 gm/dl. The mean hemoglobin level at 4 weeks after therapy in group B was 9.38 gm/dl

Table 7: Mean hematological parameters at the start of therapy and 4 weeks after therapy

Parameter	Group A		Group B	
	Initially	At 4 weeks	Initially	At 4 weeks
S. Iron (µg/dl)	33.76	60.00	33.58	56.98
TIBC (µg/dl)	409.60	391.88	410.18	394.75
MCV (fl)	61.88	63.39	61.23	62.93
MCH (%)	28.49	29.88	28.60	29.71
MCHC (pg)	24.08	26.29	23.76	24.46

Table 8: Achievement of target hemoglobin (≥11 gm/dl) in both the groups at 4, 8 and 12 weeks after starting therapy

Hemoglobin level (gm/dl)	Group A						Group B					
	4 weeks		8 weeks		12 weeks		4 weeks		8 weeks		12 weeks	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
≥11	2	4	42	84	50	100	1	2	40	80	49	98
<11	48	96	8	16	—	—	49	98	10	20	1	2
Total	50	100	50	100	50	100	50	100	50	100	50	100

Table 9: Adverse effects in both the groups

Adverse effect	Group A (n = 50)		Group B (n = 50)	
	No.	%	No.	%
Injection site reaction	1	2	2	4
Rash	1	2	2	4
Abdominal pain	—	—	—	—
Constipation, diarrhea	—	—	—	—
Hypersensitivity reaction including anaphylacoid reaction, hypertension, hypotension	—	—	—	—
Headache	3	6	4	8
Nausea	1	2	2	4
Total	6	100	10	100

Grade 1 (adverse reaction): headache, nausea, abdominal pain, constipation, diarrhea, rashes, injection site reaction.
Grade 2 (adverse reaction): hypersensitivity reaction including anaphylacoid reaction, paresthesia, dyspnea, dysguesia, vomiting, pruritus, urticaria, myalgia, arthalgia, backpain, fever, fatigue

DISCUSSION

The mean age in group A was 25.30 years and mean age in group B was 25.56 years (Table 1). In group A, 20% cases were primiparous and 80% cases were multiparous (Table 2). Majority of the cases belonged to lower middle status (class IV) according to modified BJ Prasad classification in both the groups (Table 3).

So, in the present study, we found that the mean hemoglobin level before starting therapy in group A was 6.14 gm/dl and in group B was 6.06 gm/dl (Table 4), there

was an increase of 2.52 gm/dl in hemoglobin level after 2 weeks of therapy and mean hemoglobin level was 8.66 gm/dl in group A and in group B there was an increase of 1.95 gm/dl in hemoglobin level and the hemoglobin level was 8.01 gm/dl at 2 weeks after therapy (Table 5). This difference further increased at 4 weeks after therapy. The hemoglobin level was 10.01 gm/dl in group A (rise of 3.95 gm/dl) at 4 weeks of therapy and in group B hemoglobin level was 9.38 gm/dl (rise of 3.32 gm/dl) (Table 6). Mean hematological parameters increased significantly after 4 weeks in FCM group *vs* iron sucrose group (Table 7). Improvement of mean hematological parameter is more in group A than group B after 4 weeks of iron therapy. In group A, 84% cases achieved the target hemoglobin at 8 weeks after therapy and 100% cases achieved target hemoglobin at 12 weeks after therapy. In group B, 80% cases achieved the target hemoglobin at 8 weeks after therapy and 98% cases achieved target hemoglobin at 12 weeks after therapy (Table 8). In group A, 92% cases were completely relieved of there symptoms at 4 weeks after therapy and in group B only 84% cases were completely relieved of there symptoms. In group A only 12% cases had grade I adverse effects and in group B 20% cases had grade I adverse effects. None of the case in both the groups had grade II adverse effects (Table 9). So, we can say that the intravenous iron carboxymaltose therapy is more effective and safe therapy to treat iron deficiency anemia during postpartum period.

In Breymann et al study in postpartum period showed that the mean Hb rise was 3.37 g/dl in FCM group and 3.29 g/dl in ferrous sulphate group after 12 weeks of iron therapy.[9]

In Seid et al study in postpartum women, FCM group women achieved target hemoglobin (>12 gm%) in higher number of patient as compared to iron sucrose after 6 weeks of iron therapy.[10]

In the study done by Von Wyck et al Hb rise greater than or equal to 2 gm/dl in FCM group than oral iron therapy after 6 weeks of iron therapy.[11]

CONCLUSION

In the present study, the cases selected in both the groups were comparable in terms of age, parity, and socio-economic status. The mean hemoglobin level achieved in intravenous iron carboxymaltose group was significantly higher and the rate of increase in hemoglobin level was also significantly higher in intravenous iron carboxymaltose group. The number of cases achieving target hemoglobin was significantly higher in intravenous iron carboxymaltose group. The incidence of adverse effects was also significantly lower in intravenous iron carboxymaltose group. Thus, we can conclude that intravenous iron carboxymaltose therapy is safe, convenient, more effective and faster acting than intravenous iron sucrose therapy for the treatment of severe iron deficiency anemia during postpartum period.

REFERENCES

1. Morrison J, Patel ST, Watson W, Zaidi QR, Mangione A, Goss TF. Assessment of the prevalence and impact of anaemia on women hospitalized for gynaecology condition associated with heavy uterine bleeding. J Repord M ED 2008;53:323-330.
2. Bodnar LM, Cogswell ME, McDonald T. Have we forgotten the significance of postpartum iron deficiency anaemia? Am J Obstet Gynecol 2005;193:36-44.
3. Broche DE, Gay C, Armand-Branger S, Grangeasse L, Terzibachian JJ. Acute postpartum anaemia. Clinical practice Leberecht A, Haberlin F, Eberhard J. Anaemia in puerperium; parenteral iron substitution renders erythropoietin therapy dispensable. Geburtshilfe Frauenheilkd 1995;55:167-170.
4. Prewusny KG, Huck R, Huck A, Breymann C. Parenteral iron sucrose complex. Br J J Nutr 2002;88:3-10 and interest of intravenous iron. Gynecol obstet fertil. 2004;32:613-619.
5. Al Momen AK, Al Nuaim l, Saddique A, Abutalin Z, Khashogi T, et al. Intravenous ironsucrose complex in the treatment of iron deficiency anaemia during pregnancy. Eur J Obstet gynecol Reprod Boil 1996;69:121-124.
6. Bayoumeu F, Subiran-Cusset C, Baka NE, Eegagneur H, Monnier-Barbarino P, Laxenaire MC. Iron therapy in iron deficiency anaemia in pregnancy: intravenous route versus oral route. Am J Obstet gynecol 2002;186:518-522.
7. Umbreit IH, Conrad, Moore EG, Latocer LF. Iron absorption and cellular transport: the mobi (ferrin/paraferic) paradigm; seminars on hematology 1998;35:13-26.
8. Willianmson C, Love S, Conen H, Soldem K, Mclelland DB, et al. Serious hazards of transfusion inititative: analysis of the first two annual reports: BMJ 1999;319:16-19.
9. Breymann C, Gliga F, Bejenariu C, Stirzhova N. Comparative efficacy and safety of intravenous ferric carboxymaltose in the treatment of iron deficiency anaemia. Int J Gynaecol Obstet 2008;101:67-73.
10. Seid MH, Derman RJ, Baker JB, Banach W, Goldberg C, Rogers R. Ferric carboxymaltose injection in the treatment of postpartum iron deficiency anaemia: a randomized controlled clinical trial. Am J Obstet Gynaecol 2008;199:435-437.
11. Van Wyck DB, Martens MG, Seid MH, Baker JB, Mangione A. Intravenous ferric carboxymaltose compared with oral iron in the treatment of postpartum anaemia: a randomized controlled trial. Obstet Gynecol 2007;110:267-278.