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Research Article

To evaluate the efficacy and safety of single dose intravenous iron carboxymaltose verses multidose iron sucrose in post-partum cases of severe iron deficiency anemia

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ABSTRACT

Background: Iron deficiency is the most common nutritional deficiency worldwide. Anemia is the most common treatable, direct/indirect cause of maternal and neonatal morbidity and mortality in developing countries like India.

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

Results: In group A mean Hemoglobin 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 hemoglobin at 12 weeks after therapy while in group B 98% cases achieved target hemoglobin at 12 weeks after therapy. In group A 12% cases have grade 1 adverse reaction while in group B 20% cases have adverse reaction.

Conclusions: Administration of intravenous iron has a good clinical result, with minimum adverse reactions. Thus we can conclude that intravenous ferric 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: Ferric carboxymaltose, Iron sucrose, Iron deficiency anemia, Hemoglobin

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 another important causes of postpartum anemia (PPA). Randomized clinical trials have shown that lack of prenatal iron supplementation is associated with low ferritin stores throughout the postpartum period.¹ This is because pregnancy requires about 1000 mg of additional iron, which cannot be met

by the typical diet.^{2,3} These women with Iron Deficiency Anemia (IDA) especially during the second and third trimester of pregnancy are more likely to suffer from postpartum hemorrhage (PPH) and further worsen anaemia and its related complications. PPH is also an important cause of postpartum anemia.⁴

Peri partum iron deficiency anemia is significant cause of maternal, fetal as well as infants morbidity and mortality.(a) 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 deficiencies.⁵⁻⁷ Orally given iron has side effects like intolerance, nausea, vomiting, epigastric pain, diarrhoea, constipation, unpredictable absorption rate and poor compliance.⁸

Iron was 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

Aims and objective: Comparative study of efficacy and safety of single dose intravenous iron carboxymaltose and multi dose intravenous iron sucrose therapy in postpartum women of sever iron deficiency anemia.

METHODS

Study was carried out in the department of obstetrics and gynaecology, S. N. medical college Agra during 2 year duration from October 2012 to October 2014.

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

Group - A: 50 cases in this group receive intravenous iron carboxymaltose therapy.

Group - B: 50 cases in this group receive intravenous iron sucrose therapy.

Inclusion criteria

All normal delivered and caesarean delivered patients with IDA

Exclusion criteria-

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

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

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:

Table 1: Intravenous injections (Iron carboxymaltose complex).

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)

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 min. alternate days up to 5 days.

RESULTS

The mean age in group A was 25.30 years and mean age in group B was 25.56 years (Table 2). In group A 20% cases were primiparous and 80% cases were multiparous (Table 4).

Majority of the cases belonged to lower middle status (class 4) according to modified B. J. Prasad classification in both the groups (Table 3).

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 5), 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 (Table 6).

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 7).

Table 2: Distribution of cases according to age.

Age (years)	Group A		Group B	
	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 3: Distribution of cases according to socioeconomic status.

	Group A		Group B	
	No.	%	No.	%
Class-III (Upper middle)	6	12%	7	14%
Class -IV (Lower middle)	35	70%	34	72%
Class -V (Poor)	9	18%	9	18%

Table 4: Distribution of cases according to parity.

Parity	Group A		Group B	
	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 5: 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			

Table 6: 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			

Table 7: 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			

Table 8: 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 9: Adverse effects in both the groups.

Adverse effect	Group A		Group B	
	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

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. In group A 92% cases were completely relieved of their symptoms at 4 weeks after therapy and in group B only 84% cases were completely relieved of their 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. So we can say that the intravenous iron carboxymaltose therapy is more effective and safe therapy to treat iron deficiency anemia during postpartum period.

DISCUSSION

In obstetrics, red blood cell transfusions currently account for 3-4% of all transfusion events and the majority of these occur following Post-Partum Hemorrhage (PPH) in UK.⁹ PPH is the leading cause of maternal mortality in obstetrics, and is estimated to occur at a rate of 13.1%.¹⁰ Despite its enormous clinical utility, RBC transfusion is a treatment with well described adverse events and risk, and should ideally be avoided. Additionally blood is both costly and in ever increasingly short supply.¹¹⁻¹³

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 and rate of increase in intravenous iron carboxymaltose group was significantly higher. S. Bhandari also supported that intravenous ferric carboximaltose is cost effective as it significantly reduces need of blood transfusion and its complications.^{14,15}

The incidence of adverse effects was also significantly lower in intravenous iron carboxymaltose group in our study. C. Breyman et al. and R. Eneshaliev et al. showed in their study that ferric carboximaltose in iron deficiency anemia in patients of inflammatory bowel disease as well as in obstetrics is quite safe and effective.^{16,17}

CONCLUSION

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.^{18,19}

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Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethics committee

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