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Intravenous Iron Therapy for the Treatment of Iron Deficiency Anemia: Ferric Carboxymaltose Vs Iron Sucrose

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ABSTRACT

Background: *Postpartum anemia effects every fourth women in India. Parenteral iron therapy in comparison to oral is much faster in correction of Hb level, and replenishment of iron stores with much better compliance. The two available preparations of parentral iron that is iron sucrose and ferric carboxymaltose were compared in the present study for safety and efficacy.* ***Methods****: This prospective observational study was conducted in the department of obstetrics and gynecology (SRHU Dehradun Uttarakhand) for a period of 18 month. 180 women of iron deficiency anemia were divided into two groups. 100 mg of IV iron sucrose was given in multiple dose of 200mg on alternate day over a period of 10 days to one group. 1000 mg of IV ferric carboxymaltose was given a single dose to the 2nd group of 90 women. side effects and reactions were noted.* ***Results****: Hb% and serum ferritin were done after 14 day of last injection the mean rise in HB in both groups were 1.71%(Group I) versus 3.20 % (Group II) serum ferritin levels was found significantly higher (p vol < 0.0001) in group II there were no serious adverse reactions in either group.* ***Conclusions****: FCM proved its efficacy better than iron sucrose. short stay at hospitals, large dose were given at over with very few adverse reactions were the main advantage.*

Key words*: Iron sucrose, ferric carboxymaltose, post-partum anaemia, efficacy, safety.*

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INTRODUCTION

Nutritional deficiency anemia is the most common deficiency disorders affecting more than 2 billion people worldwide. About 52 % of pregnant women of developing countries are suffering from anemia according to WHO.[1]

In pregnancy, there is an increase in demand of iron. In Singleton pregnancy, the maternal need for iron averages 1000mg. Out of these, 300 mg is for fetus and placenta, 500 mg for maternal hemoglobin mass expansions and 200 mg is shed normally through the gut, urine and skin.[2] In pregnancy, deficiency of iron and other nutrients is increased further because of active transport of these nutrients from mother to baby, who is already iron depleted .Anemia may result from inadequate dietary intake , parasitic infection or malaria and blood loss at time of birth.[3] Post-partum anemia has been associated with longer hospital stay, delayed wound healing, postpartum depression, poor mother – infant bonding and delayed development of infant.[5-7]

Oral iron therapy is the standard approach to treatment for majority of them, But most patients with the increased dose of iron develop nausea, vomiting, motility disorders like reflux esophagitis, indigestion, constipation and have become non-compliant.[8-10] Blood transfusion is reserved

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for severe cases and more over it carries the risk of transmitting the infections, anaphylaxis and Rh isoimmunization, therefore Parentral iron therapy is advantageous in patient were oral iron therapy cannot be given, especially in cases of inflammatory bowel disease, chronic renal disease in association of pregnancy and when patient is intolerant to oral iron.[11] It helps in restoring iron stores faster and more effectively than oral iron.

Iron dextran and iron sorbitol citric acid have been widely used in the past. They carried the danger of unpredictable anaphylaxis and therefore were abandoned[12] by the doctors in favour for iron sucrose. For many years, intravenous iron sucrose was given in pregnant and postpartum patients with safety. But multiple low doses has been the main disadvantage.[13]

Recently ferric carboxymaltose (FCM) has been introduced. FCM is a parentral iron dextran free product. It's an iron complex that consists of ferric hydroxidase core stabilized by a carbohydrate shell. it allows controlled delivery of iron to the cells of reticuloendothelial system, ferritin and transferrin with minimal risk of large amounts of iron being released into the serum.[14] It has a very low immunogenic potential and therefore not predisposed to high risk of anaphylactic reactions. Its properties permits the administration of large doses (15 mg/kg), maximum of 1000 mg/infusion without requirement of a test dose.[15-18]

Objective

To evaluate the efficacy and safety profile of FCM versus Iron sucrose in treatment of postpartum anemia

METHODS

It was a prospective comparative study done over a period of one and half year from March 2016 to August 2017, in department of Obstetrics and Gynecology, Swami Rama Himalayan university which is a tertiary care centre of Uttarakhand, India. The Ethics Institutional Review Board of Swami Rama Himalayan University approved the study and informed consent was obtained from all participants.

All postpartum patients (postnatal or post caesarean) within 10 days of delivery with Hb > 7 and < 10 gm% with serum ferritin < 15 ng/dl were included in the study. Patients with anemia other than iron deficiency anemia were excluded. Peripheral blood smear, complete hemogram and serum ferritin were done in all patients and randomly divided into two groups 1000 mg of IV sucrose was given in multiple doses of 200 mg diluted in 200 ml NS over 30 min alternate days over a period of 10 days to group I of 90 women. 2nd group of 90 women were given 1000 mg of IV FCM diluted in 250 ml NS over 15min given as single dose.

Patients were observed for one hour for any side effect like nausea, vomiting, headache pain or burning or the site if infection, rigors, fever, tingling sensation or itching over the body, flushing, and dizziness hypotension or hypertension or diarrhoea. Hemoglobin and serum ferritin were repeated after two weeks.

Statistical Analysis:

To calculate the mean +- SD, descriptive analysis was used. means of the parameters of both the groups were compared using independent student to test. A p value of 0.05 was considered significant. Statically analysis was performed using the SPSS software package (SPSS for windows, version 22.0; SPSS Inc, Chicago, IL, USA).

RESULTS

The demographic profile and the baseline parameters, were comparable in both the groups (p>0.05) which included age, parity, antenatal anemia, mode of delivery, postpartum haemorrhage, baseline hemoglobin and serum ferritin levels. The mean Hb after treatment with IS and FCM was 9.1 and 10.34 gm % respectively which both were statistically significant (P value 0.000 and 0.000) table 2. The mean ferritin after treatment with IS and FCM was 180.35 and 190.31 ng/dl, respectively which were also statistically significant (P value 0.000 and 0.000) (Table 3).

Mean increase was 1.67 in IS group as compared to 2.82 in FCM group. Mean increment in ferritin was 113.37 and 124.61 in IS and FCM groups respectively. Comparison between both the groups were done using independent students test. The rise in Hb levels and serum ferritin concentration were found to be statistically significant in FCM group over IS group (p value 0.000 and 0.000 Table 4) When comparison FCM with IS the rates of nausea, injection site reaction (that is discoloration, extravasation or pain) to headache, hypertension, dizziness, vomiting, diarrhea were similar.

However, rate of hypotension is fewer in FCM groups and flushing is seen more with IS group. severe anaphylaxis reaction were seen in none.

Table-1. Demography and baseline data.

Parameters	Group 1 Is (n=90)	Group 2 FCM (n=90)	P Value
Age	25.9+- 4.90	27.28 +- 4.75	0.562
Parity	3.18+-1.91	3.39 +-1.87	0.586
Antenatal Anemia	58(64.44%)	59 (65.55)	0.858
LSCS	36 (40%)	35 (39.17)	0.894
PPH	3 (3%)	4 (3.65%)	0.763
Mean Hb (gm%)	7.428 +-0.49	7.510+-0.59	0.192
Mean ferritin(ng/dl)	66.98+_34.62	65.7+-33.97	0.827

IS – iron sucrose.

Table 2 Comparison of mean Hb pre and post transfusion with IS an FCM injections.

	Pre-transfusion mean Hb (gm%)	Post transfusion mean Hb (gm%)	P value
Group 1	7.428+-0.49	9.1+-0.49	0.000
Group 2	7.51+-0.59	10.34 +_0.96	0.000

Table 3: comparison of mean ferritin, pre-and post transferrin with IS and FCM injections.

	Pre-transfusion mean ferritin ng/dl	Post transfusion mean ferritin ng/dl	P value
Group 1	66.98+-34.62	1.8035+-30.66	0.000
Group 2	65.7+-33.97	190.31+-30.04	0.000

Table 4: Data showing the mean increase in HB and `ferratin Post transfusion in both the groups:

Parameter	Group 1	Group 2	p value
Mean difference in Hb increase in (gm%)	1.67	2.83	0.000
Mean difference in ferratin (ng/dl) increase	113.37	124.61	0.000

Table 5: Emergency adverse events occurred in both the groups.

	Group 1(%)	Group 2 (%)
Nausea	2.8	3.1
Vomiting	0.7	0.8
Headache	1.3	1.4
Flushing	1.0	0.2
Dizziness	1.2	1.3
Hypotension	0.5	1.7
Diarrhoea	0.5	0.7
Injection site reactions	1.6	1.8

DISCUSSION

In the present study, we compared the efficacy and safety of FCM with IS in postpartum anemia patients. IT showed that IS and FCM both can be used in the postpartum women with iron deficiency not only for correction of deficit in the Hb level but also for restitution of iron stores. Both treatment modalities had a significant post infusion rise in Hb levels and ferritin levels which is similar to previous studies above[19-22], but Hb and ferritin anemia were statistically significant. Our study considerate previous studies done by Malek A et al and khalla fallah et al in 2010[23,24] done independently which state that FCM is well tolerated I postpartum women, has fewer side effects and much better compliance as compared to IS group. Injection site discoloration is a cosmetic concern. It is recommended to flush the infusion catheter with saline before removing it.

CONCLUSION

Our study showed FCM is better and more rapid in improving Hb concentration and reconstitution of iron stores. Large doses could be given over a very short period which was very economic for the patient and it reduced the burden for hospital workers and resources.

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