



COMPARATIVE STUDY OF IRON THERAPY BY VARIOUS ROUTES IN MANAGEMENT OF POSTPARTUM ANEMIA

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ABSTRACT

Objective- To compare the efficacy, side effects, compliance of different routes of iron therapy in postpartum iron deficiency anemia.

Material & methods- study was carried out at UISEMH, department of obstetrics and gynecology, GSVM Medical college, Kanpur on 375 postpartum iron deficiency anemic patients based on Hb < 10 gm% 24 hours post-delivery and serum ferritin < 15 micro/l. All patients were divided according to their severity of anemia and were subjected to iron therapy by various routes (oral/im/iv) and results were analyzed by applying ANOVA test.

Results – Rise of Hb level was significant in all grade of anemia after treatment with any route of iron therapy (intravenous= intramuscular> oral route). Difference in rise of Hb level is most pronounced in oral versus IV treatment in severe anemia category (intravenous > oral: mean difference of Hb rise was 2.868 gm./dl).

Conclusion- Parenteral iron have shorter treatment periods, increased likelihood of compliance, a lack of gastrointestinal side effects, and rapid replenishment of iron stores, making them superior to oral ferrous sulphate in treatment of mild to moderate postpartum iron deficiency anemia and also decreasing the need of blood transfusion in severe postpartum iron deficiency anemia.

KEYWORDS : iron deficiency anemia, hemoglobin, iron sucrose, iron dextran, oral iron

INTRODUCTION

Childbirth is very enjoyable period for a woman and her family. However, unforeseen complication like postpartum hemorrhage can exacerbate preexisting anemia and make this time very difficult. The world health organization estimated that about 40% of world's population (more than 2 billion individuals) suffers from anemia. In Asia, the prevalence of anemia was estimated to be 44% in non-pregnant women and 60% in pregnant women. Anemia affects almost two-thirds of pregnant women in developing countries; it is associated with poor maternal and perinatal outcomes. In India, anemia is the second most common cause of maternal death, accounting 20% of total maternal death.

Oral iron therapy has been used for centuries as a treatment of iron deficiency anemia, this method of treatment is slow to take effect, often requiring several weeks for results to transpire. Blood transfusions have been used in the treatment of postpartum anemia, but limited availability and risks associated with it limits its use. Alternative treatment methods for anemia include intravenous (IV or IM) iron therapy. Hematologic changes are fairly rapid with parenteral iron therapy and have a positive effect on the body's iron storage. The objective of this study was to compare the efficacy, side effects, compliance of different routes of iron therapy according to severity of postpartum iron deficiency anemia.

MATERIAL AND METHODS

Our study was concurrent parallel study design carried out at UISEMH, department of Obstetrics and Gynecology, GSVM Medical College, Kanpur, on 375 patients who were selected as iron deficiency anemic patients based on their hemoglobin (< 10 gm% 24 hour post-delivery), general blood picture (microcytic hypochromic) and serum ferritin level (< 15 microgm/l). After selection patients were divided into three groups according to their hemoglobin level:

- Mild anemia (Hb= 8-10 gm%)(n=152)
- Moderate anemia (Hb= 7-<8 gm%)(n=154)
- Severe anemia (Hb= <7 gm%)(n=69)

Patients from each group randomly divided into three groups-

Group I: Patients of this group given oral iron therapy.

Group II: Patients of this group given intramuscular iron therapy.

Group III: Patients of this group given intravenous iron therapy.

After taking informed consent to participate in the study and approval from ethical committee a detailed clinical history and thorough clinical examination was done.

Material-

- Tb Ferrous Sulfate 300 mg (containing 50 mg of elemental iron)
- Inj Iron Dextran (2 ml=100mg of elemental iron)
- Inj Iron Sucrose (5 ml=100 mg of elemental iron)

Methods-

Total amount of iron needed by any individual patient based on Hb deficit was calculated from a standard formula:

Body weight (kg) x 2.3 x (12-patient's Hb in gm/dl) + 500 mg (for iron stores) (HARRISON 16th edition)

- Pretreatment baseline investigation done before starting treatment protocol.(at day-0)
- For oral iron treatment tablet ferrous sulfate was given 300-600 mg three times a day 1 hour before meal spreading over 4 weeks up to total calculated dose assuming that only 10-15% absorption in gut.

For parenteral therapy-

- Iron Dextran- one ampoule of 2ml containing 100 mg elemental iron given on every alternate day by intramuscular route (Z technique) on alternate buttock after sensitivity testing with 25 mg over 10 minutes of first dose up to total calculated amount of iron needed.
- Iron Sucrose-one ampoule of 5 ml containing 100 mg of elemental iron given every alternate day up to total calculated dose by intravenous drip infusion (one 5 ml ampoule (100mg) is diluted in 100 ml of .9% normal saline). The first 25 mg (25ml) was given as a test dose over 15 minutes (100mls/hr).if no adverse reactions occur during this time, the rest of the solution was given in next 15 minutes. In subsequent doses test dose is not required and infusion of 100 ml should take approximately 30 minutes to give.
- A set of observations (pulse, BP, temperature) would be taken

before the start of the infusion, after 15 minutes and at the end of infusion.

- D. Facilities for cardiopulmonary resuscitation was made available when administering parenteral iron treatment in the event of exceptionally rare serious anaphylactic or allergic reaction. Mild allergic reaction was managed by stopping the administration of iron sucrose and giving chlorpheniramine 10 mg iv slowly. The infusion was then started at slower rate and the woman observed closely.
- Samples of blood withdrawn at 28th day and sent for investigations.
- Observation was noted by rise in Hb and general blood picture
- Out of 375 patients 33 lost on follow up and analysis was made on 342 patients.
- Results were analyzed using Analysis of Variance test (ANOVA).
- If P value is < 0.001, considered statistically highly significant.
- Tukey-Kramer Multiple Comparisons post hoc test has been used to compare individual groups. If the value of q is greater than 3.354 then the difference is statistically significant.

DISCUSSION AND RESULTS

In this study we compared the hemoglobin level by different routes of iron treatment in different grades of postpartum iron deficiency anemia by applying ANOVA test and Tukey-Kramer Multiple Comparisons post hoc test. It is found that in all groups p value was <.001 and q value was >3.354 showing that all groups noticed rise in Hb level after iron therapy which is statistically highly significant. Difference in rise in Hb level is most pronounced in IV versus Oral iron treatment group in severe anemia category (mean difference is 2.868) (Table 1 & 2). This shows that as the severity of anemia increase response to intravenous iron treatment increases as compared to oral iron treatment. This analysis is also supported by Bhandal et al (2006) who compared oral versus IV iron treatment in postpartum anemic patients. The results indicated that both groups showed improvements in Hb levels throughout the study with higher levels in the IV group on days 5 and 14 (p<0.01). The IV group had a mean increase in Hb level from baseline at day 5 of 2.5g/dL compared to the oral group of 0.7g/dL.

Our study shows that gastrointestinal side effects were mainly in oral iron therapy, compliance was best in IV iron therapy followed by in IM iron therapy. Mild allergic reaction and pain at local site observed most in IM iron therapy followed by in IV route of iron therapy. Severe allergic reactions did not occurred in any patient. These observations are comparable to study by Alleyne et al (2008), Giannoulis et al (2009). Alleyne et al (2008) stated that Side effects are very common occurrence with oral iron supplementation. Nausea, constipation, epigastric discomfort, and vomiting are reported in approximately 10-20% of patients taking oral iron. By Giannoulis et al (2009), iron sucrose is quite safe for the liver in daily doses of 100 mg in comparison with other iron supplements. The presence of iron sucrose in the plasma circulation is associated with absence of any undesirable side effects partly due to lower allergenic effect of the sucrose complex than iron dextran and also due to slow release of elementary iron from the complex (Table 3).

CONCLUSION

- Both iron dextran and iron sucrose are safe and effective ways to treat postpartum iron deficiency anemia.
- Parenteral iron have shorter treatment periods, increased likelihood of compliance, a lack of gastrointestinal side effects, and rapid replenishment of iron stores, making them superior to oral ferrous sulfate.
- Iron dextran and iron sucrose both have similar efficacy but more incidence of allergic reactions and repeated painful intramuscular injections of iron dextran makes it less preferable than iron sucrose in treating postpartum iron deficiency anemia.

OBSERVATIONS AND DISCUSSION

TABLE 1 MEAN RISE IN HEAMOGLOBIN (gm/dl) AFTER TREATMENT (@DAY=28)

Route of Iron Therapy Grade of Anemia	Oral	I/M	I/V
Mild anemia (n=138)	1.696 (n=46)	3.396 (n=46)	3.793 (n=46)
Moderate anemia (n=138)	2.035 (n=46)	3.330 (n=46)	3.787 (n=46)
Severe anemia (n=66)	1.845 (n=22)	4.282 (n=22)	4.714 (n=22)

TABLE 2 COMPARISON OF MEAN DIFFERENCE OF HEMOGLOBIN LEVEL

GRADE OF ANEMIA	Mode Of therapy	MEAN DIFFERENCE	Q value	P value
MILD	im vs oral	1.700	27.503	<.001
	iv vs oral	2.098	33.939	<.001
	iv vs im	.3978	6.436	<.001
MODERATE	im vs oral	1.296	16.301	<.001
	iv vs oral	1.752	22.044	<.001
	iv vs im	.4565	5.743	<.001
SEVERE	im vs oral	2.436	21.564	<.001
	iv vs oral	2.868	25.385	<.001
	iv vs im	.4318	3.822	<.05

TABLE 3 INCIDENCE OF ADVERSE EFFECTS IN DIFFERENT ROUTES OF IRON TREATMENT

Adverse effects	Oral iron treatment (n=114)	IM iron treatment (n=114)	IV iron treatment (n=114)
Headache	2.6%	7%	8%
Nausea	4%	7.8%	6%
Heart burn	13%	-	-
Hiccup	5%	-	-
Constipation or diarrhea	15%	-	-
Pain at local site	-	11%	3.5%
Compliance	70%	88%	96%
Mild allergic reaction	-	31%	16%
Severe allergic reaction	-	-	-

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