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ORIGINAL ARTICLE

Intravenous Iron in Postpartum Anemia

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Abstract
Objective To compare effectiveness of intravenous iron–sucrose versus oral ferrous fumarate in postpartum anemia.
Methods In this study, 40 women with postpartum anemia with hemoglobin (Hb) less than 8 g/dl within 48 h postpartum were randomised into two groups. Group I consisted of 20 women who received 300–600 mg of intravenous iron–sucrose every alternate day for 3 days. Group II consisted of 20 women who were given 300 mg ferrous fumarate orally daily for 14 days.
Results On day 14, the increase in mean Hb level in group I was 2.4 g/dl in comparison to 1.2 g/dl in group II. Women in group I had significantly higher mean Hb values on days 7 and 14 ($p < 0.001$) than women in group II.
Conclusion These results suggest that intravenous iron–sucrose increases the Hb level more rapidly than oral ferrous fumarate in postpartum anemia without any serious side effects.

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Keywords Postpartum anemia · Iron–sucrose

Introduction

The prevalence of postpartum anemia is 27 % and a postpartum hemoglobin (Hb) level of less than 8 g/dl is observed in 10 % of women [1, 2]. It is a common problem throughout the world [3]. It is a major cause of maternal morbidity such as lethargy, headaches, tiredness, dizziness, lactation failure, and postpartum depression and mortality in resource poor countries [3–6]. Anemia may result from inadequate dietary intake, parasitic infection, or malaria, and may be exacerbated by the physiological effects of pregnancy and blood loss at the time of birth [7].

The traditional treatment for postpartum anemia is oral iron supplementation, while blood transfusion is reserved for more severe cases of anemia. High doses of oral iron usually cause some side effects, including constipation, nausea, and gastric irritation, which affect compliance. On the other hand, though blood transfusion gives excellent results, it is associated with a high risk of infections particularly with hepatitis B, hepatitis C, and human immunodeficiency virus, and not to forget serious transfusion reactions. In such a scenario, intravenous iron has been considered as an alternative. In the past, only iron dextran could be given intravenously, which was associated with severe anaphylactic reactions, but the new iron–sucrose complex is very safe with hardly any side effects [8]. Therefore, the primary objective of the current study was to

compare effectiveness of intravenous iron–sucrose versus oral ferrous fumarate in postpartum anemia.

Method

Study Subjects and Design

The study was a randomized, unblinded trial performed at the Obstetrics and Gynaecology Department of Government Medical College, Haldwani, Nainital. The study population consisted of 46 women aged 18 years or more with Hb less than 8 g/dl within 48 h postpartum. The cases with placenta previa, abruption placentae, preeclampsia, clotting disorders, and peripartum blood transfusion were excluded. The women were randomized to one of the two groups by means of a computer-generated randomization schedule. After approval of the study by the ethical committee of the Government Medical College, Haldwani, and obtaining the informed consent from the participants, 23 women were selected in group I and 23 in group II by block randomization.

Treatments

The women were divided randomly into two groups to receive intravenous or oral iron. Treatment was started at 24–48 h after delivery.

In group I: they received 300–600 mg of intravenous iron in two or three divided doses given every alternate day for 3 days. The dose was calculated by means of the formula: total iron dose in mg = 2.4 × W × deficit, where W is the body weight in kg, deficit = target Hb − actual Hb in g%. Total required dose of iron was administered as 100–200 mg iron–sucrose as a single dose repeated three times a week. Iron–sucrose was diluted in 250 ml of 0.9 % sodium chloride and administered slowly within 2 h in order to avoid any adverse reactions. This group did not receive any further iron supplementation.

In group II: the women received 300 mg ferrous fumarate capsules, containing 99 mg elemental iron, once a day for 14 days. At the end of 14 days, a pill count was carried out.

Laboratory Procedures

On day 0, all postnatal patients were subjected to complete clinical examination and we measured Hb. All patients were again subjected to the same investigations at 7 and 14 days.

Statistical Analysis

From previous studies, it was found that treatment with intravenous iron–sucrose increases the Hb level by 25 % by day 5. With 90 % power at the 5 % significance level, we needed a sample size of 20 women in each group in order to detect the difference. All analyses were conducted by SPSS version 18.0. The groups were compared by the Student's *t* test. All statistical tests were two-sided.

Results

Of the 46 patients who underwent randomization, 43 entered the first week and 41 completed the 2 weeks. Two women in group I and three in group II did not come for follow up on 14 days. The baseline characteristics of the women in the two groups were similar (Table 1). Thirty-six women had a normal vaginal delivery and the rest ten had LSCS. All patients received 800 μg of misoprostol rectally following delivery. The blood loss was between 500 to 1,000 ml for cesarean section and less than 500 ml in all cases of normal deliveries. This was calculated by the theater staff based on suction volume and swab weights.

Hb levels increased from baseline in both treatment groups at days 7 and 14 (Fig. 1). By the day 7, the mean Hb levels increased significantly in both the groups, from 6.7 ± 0.3 to 8.0 ± 0.4 g/dl in group I and 6.8 ± 0.2 to 7.2 ± 0.3 g/dl in group II. On day 14, the increase in mean Hb level in group I was 2.4 g/dl in comparison to 1.2 g/dl in group II. Women in group I had significantly higher mean Hb values on days 7 and 14 ($p < 0.001$) than women in group II (Table 2).

No serious adverse events were reported in either the intravenous group I or the oral group II. However, minor adverse effects, like headache, nausea, metallic taste, flushing of face, burning at injection site, were seen in 5 (24 %) patients in group I. Complains of gastrointestinal symptoms such as epigastric abdominal discomfort and constipation were made by 6 (30 %) women. Compliance rate of 100 % was reported and confirmed by the pill counts and history taking of black stool.

Table 1 Baseline characteristics of the women at recruitment into the study

Characteristics	Group I (intravenous) ($n = 21$)	Group II (oral) ($n = 20$)	p Value
Age (years)	24 ± 3.5	25 ± 2.7	0.28
Weight (kg)	53 ± 7.3	51 ± 7.5	0.36
Prepartum Hb (g/dl)	10.3 ± 0.5	10.5 ± 0.5	0.32
Postpartum Hb (g/dl)	6.7 ± 0.3	6.8 ± 0.2	0.22

Plus–minus values are mean ± SD

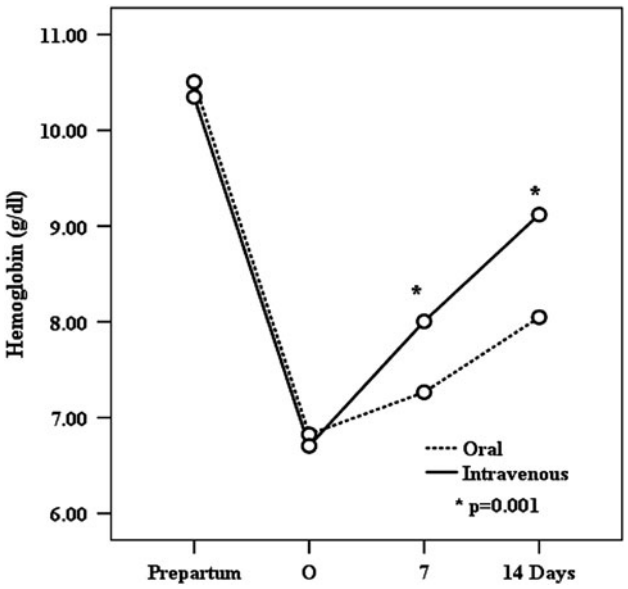

Fig. 1 Response of Hb to intravenous and oral iron therapies

Table 2 Results after treatment with iron

Variable	Group I (intravenous) ($n = 21$)	Group II (oral) ($n = 20$)	p Value
Hg (g/dl)			
Day 0	6.7 ± 0.3	6.8 ± 0.2	0.22
Day 7	8.0 ± 0.4	7.2 ± 0.3	0.001
Day 14	9.1 ± 0.4	8.0 ± 0.3	0.001

Plus–minus values are mean ± SD

Discussion

Iron deficiency anemia is one of the most common nutritional disorders in the developing world, including India. Blood loss during menstruation, pregnancy, and delivery are the chief causes of anemia in young women. In approximately 5 % of all deliveries, postpartum hemorrhage is more than 1 l. The study was done to ascertain whether administering intravenous iron–sucrose results in higher Hb concentration than oral iron in women with severe postpartum anemia.

Our results indicate that 300–600 mg of intravenous iron on alternate days for 3 days significantly increases Hb levels with a mean increase from a baseline of 1.3 and 2.3 g/dl within 7 and 14 days, respectively. Iron–sucrose appears to be effective because it is rapidly removed from the plasma and used for erythropoiesis. The finding is supported by the study done by Broche et al. [9]. in which a mean increase in Hb of 1.9 g/dl within 7 days was obtained with intravenous iron and of 3.1 g/dl within 14 days without any serious side effect. In a similar study by Bhandal and Russell [10], the mean increase in Hb level from baseline at day 5 was 2.5 g/dl in the intravenous group and 0.7 g/dl in the oral group. This study shows that oral iron therapy was also effective in correcting the postpartum anemia significantly, but its clinical relevance is questionable.

In this study, intravenous iron–sucrose was well tolerated and no serious adverse effects were reported. The reason for high tolerance was partly due to lower allergenic effect of sucrose and very slow release of elementary iron from the complex. This observation is in accordance with the previous studies that have investigated the safety profile of intravenous iron–sucrose [10–12].

Blood banks remain under considerable pressure to provide safe and sufficient blood components for clinical use, and in such a scenario, one of the main strategies must be to develop alternatives to blood transfusion. Intravenous iron–sucrose undoubtedly allows some blood transfusion to be avoided in postpartum women, even though the need for blood transfusion is unquestionable in life threatening situations.

Conclusion

These results suggest that intravenous iron–sucrose increases the Hb level more rapidly than oral ferrous fumarate in severe postpartum anemia without any serious adverse effects. This treatment will help in avoiding some blood transfusions in young women.

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